U.S. Department of Transportation

Federal Aviation Administration

Guidelines and Procedures for Maintenance of Airport Pavements

AC: 150/5380-6
Date: 12/3/82

Advisory Circular

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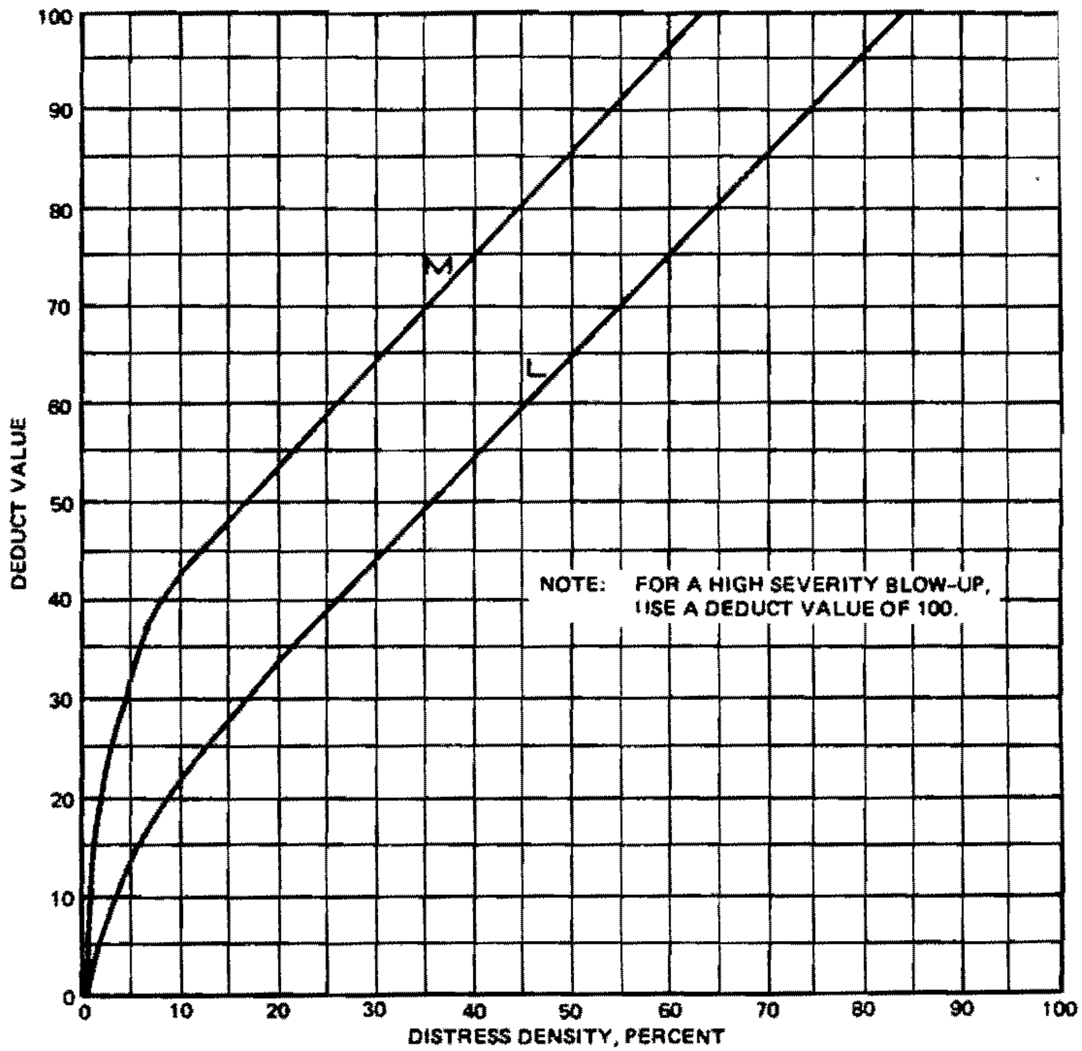

Figure A-10. Rigid pavement deduct values, distress 1, blowup

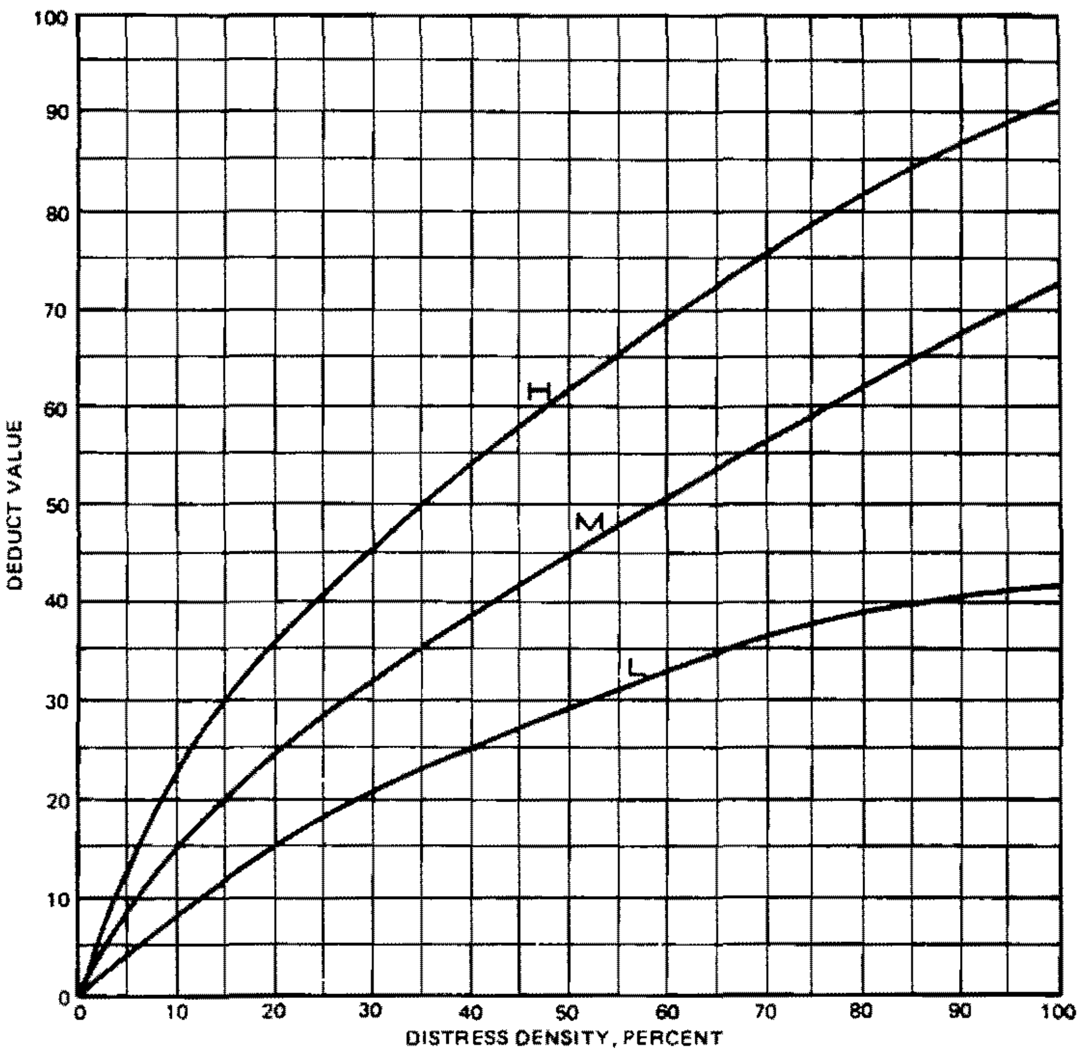

Figure A-11. Rigid pavement deduct values, distress 2, corner break

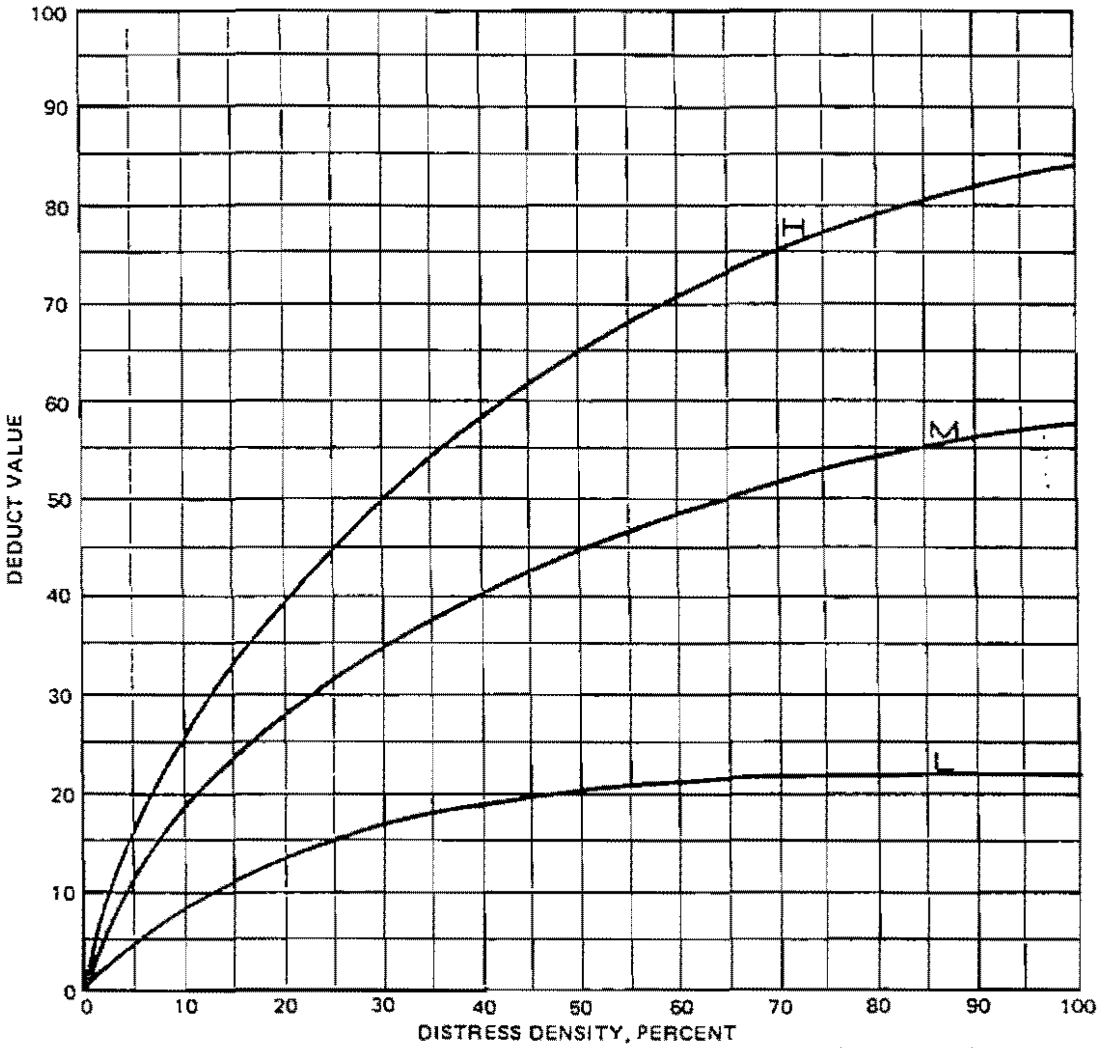

Figure A-12. Rigid pavement deduct values, distress 3, longitudinal/transverse/diagonal cracking

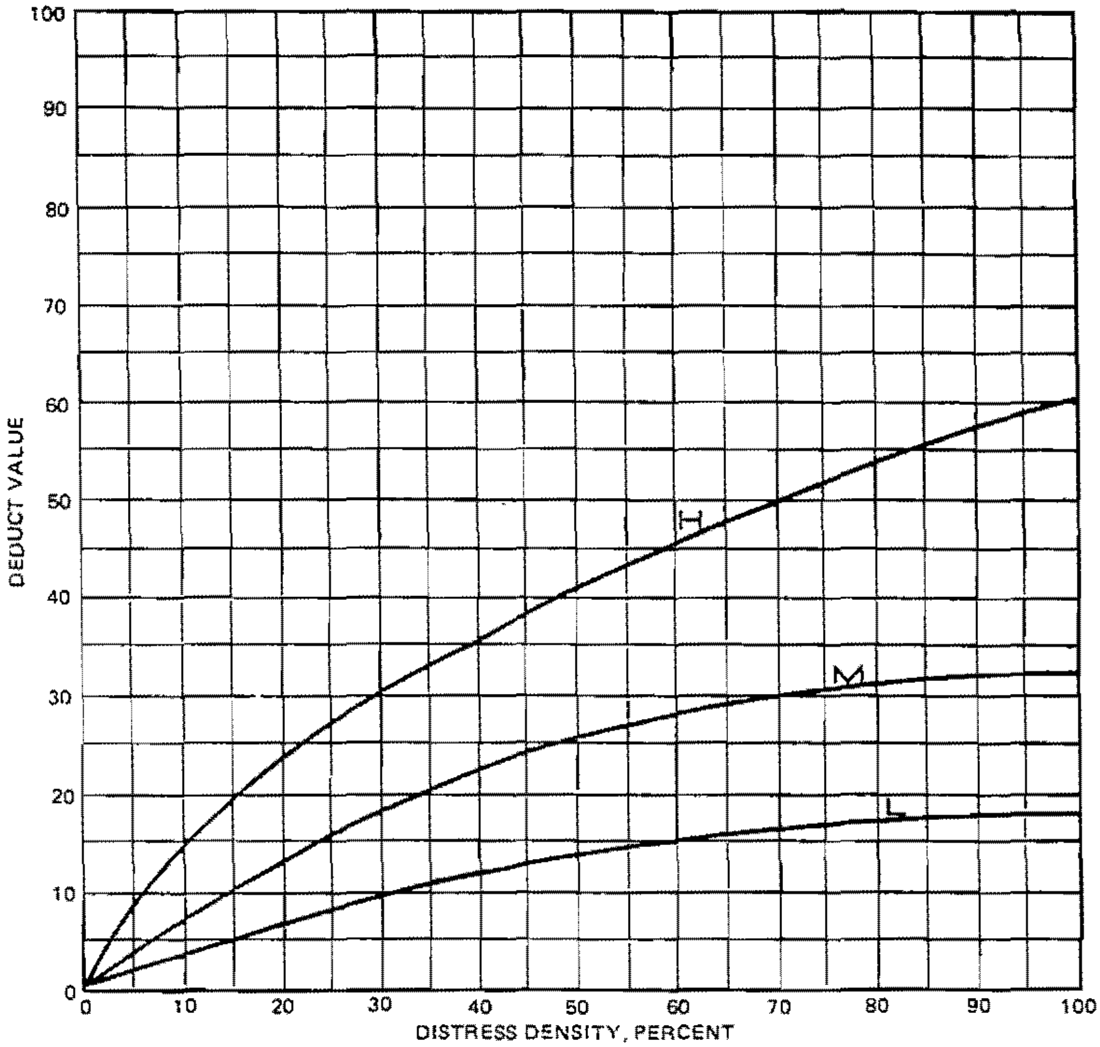

Figure A-13. Rigid pavement deduct values, distress 4, durability cracking

JOINT SEAL DAMAGE IS NOT RATED BY DENSITY. THE SEVERITY OF THE DISTRESS IS DETERMINED BY THE SEALANT'S OVERALL CONDITION FOR A PARTICULAR SECTION.

THE DEDUCT VALUES FOR THE THREE LEVELS OF SEVERITY ARE AS FOLLOWS:

1. HIGH SEVERITY - 12 POINTS
2. MEDIUM SEVERITY - 7 POINTS
3. LOW SEVERITY - 2 POINTS

Figure A-14. Rigid pavement deduct values, distress 5, joint seal damage

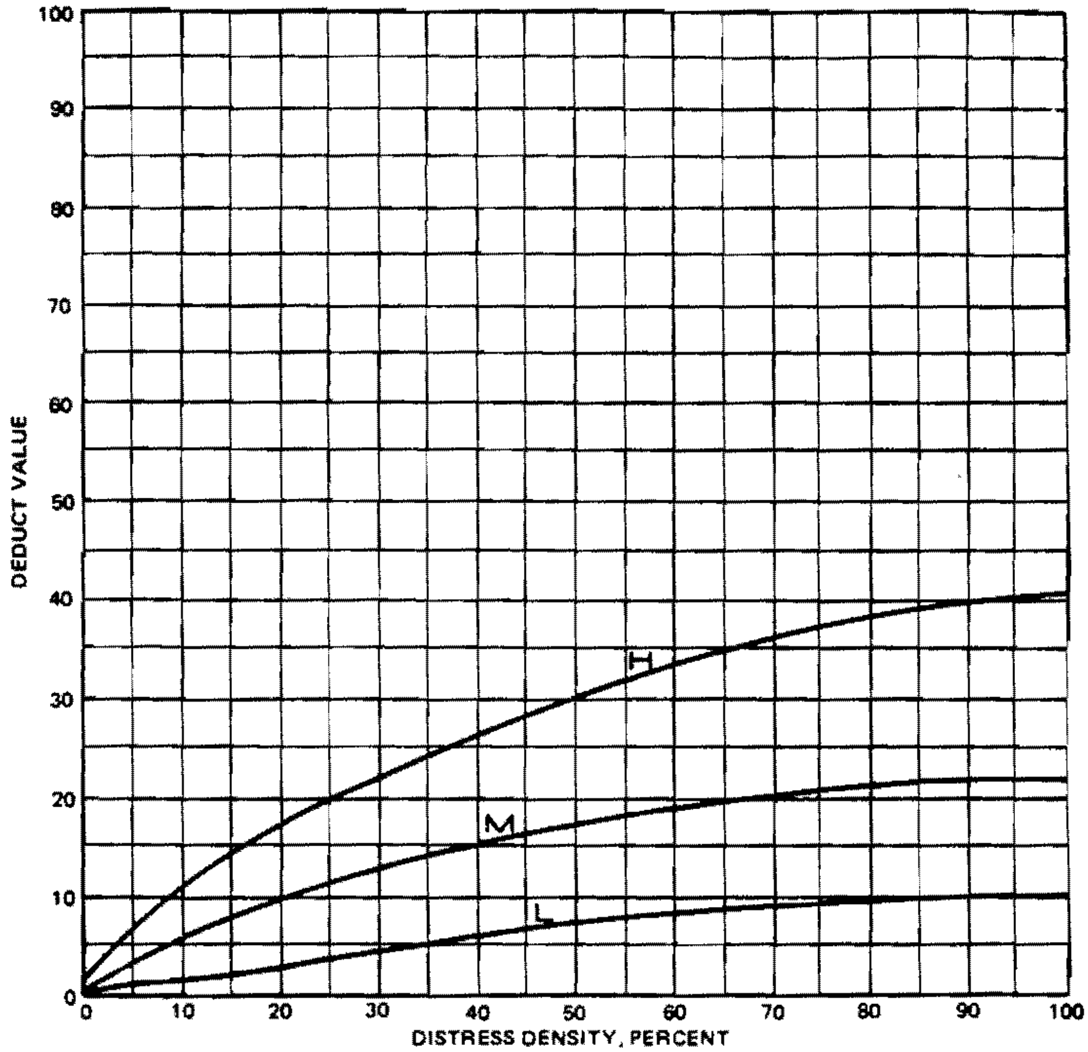

Figure A-15. Rigid pavement deduct values, distress 6, small patch

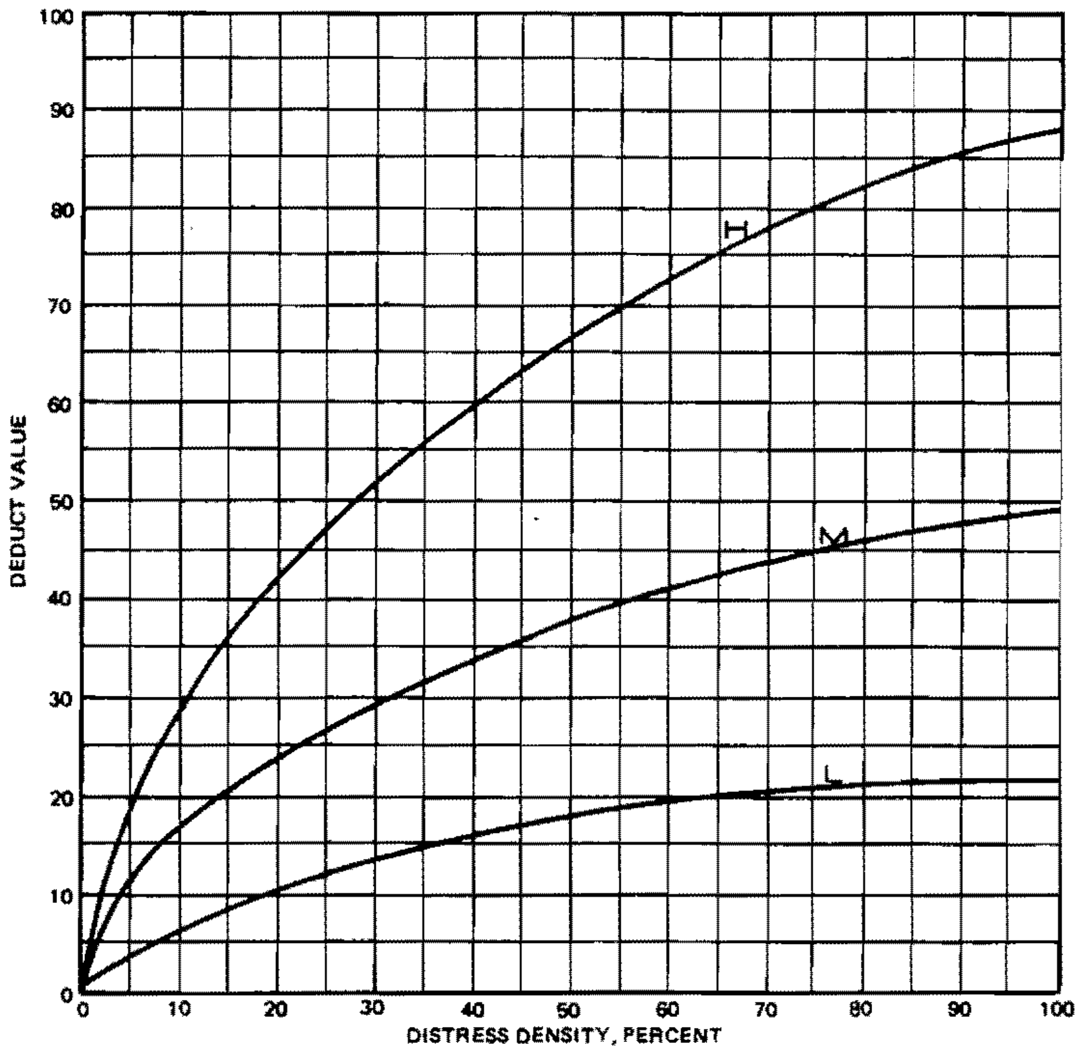

Figure A-16. Rigid pavement deduct values, distress 7, patching/utility cut defect

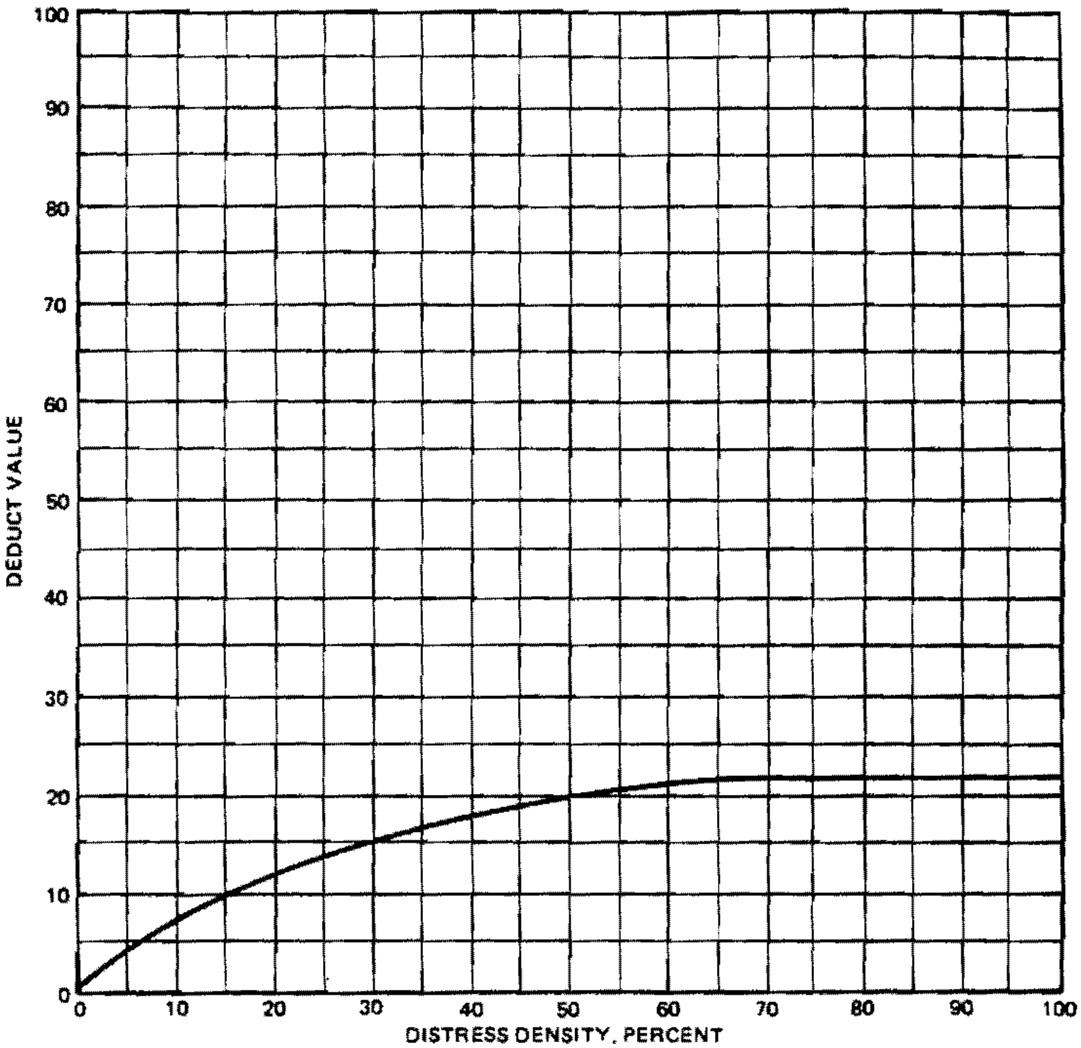

Figure A-17. Rigid pavement deduct values, distress 8, popouts

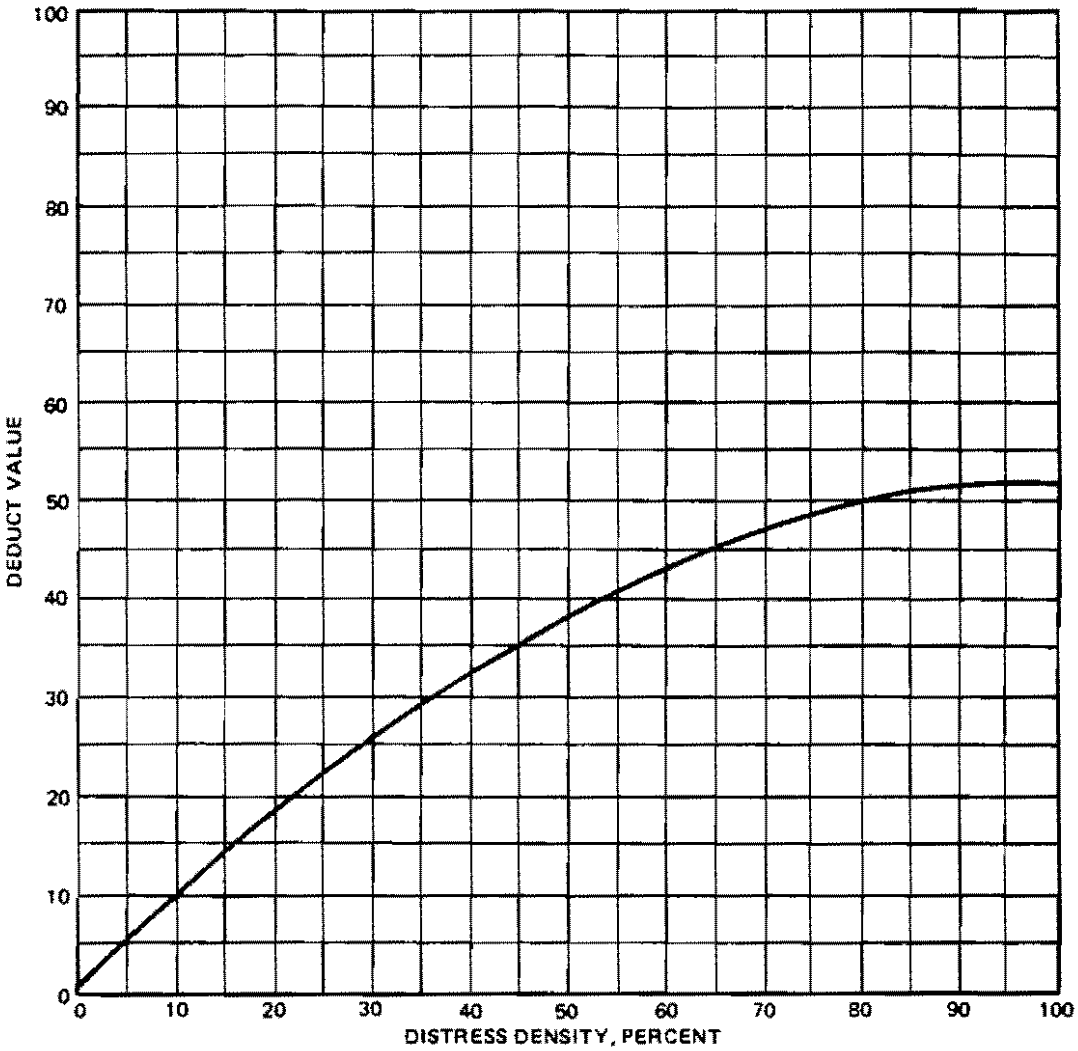

Figure A-18. Rigid pavement deduct values, distress 9, pumping

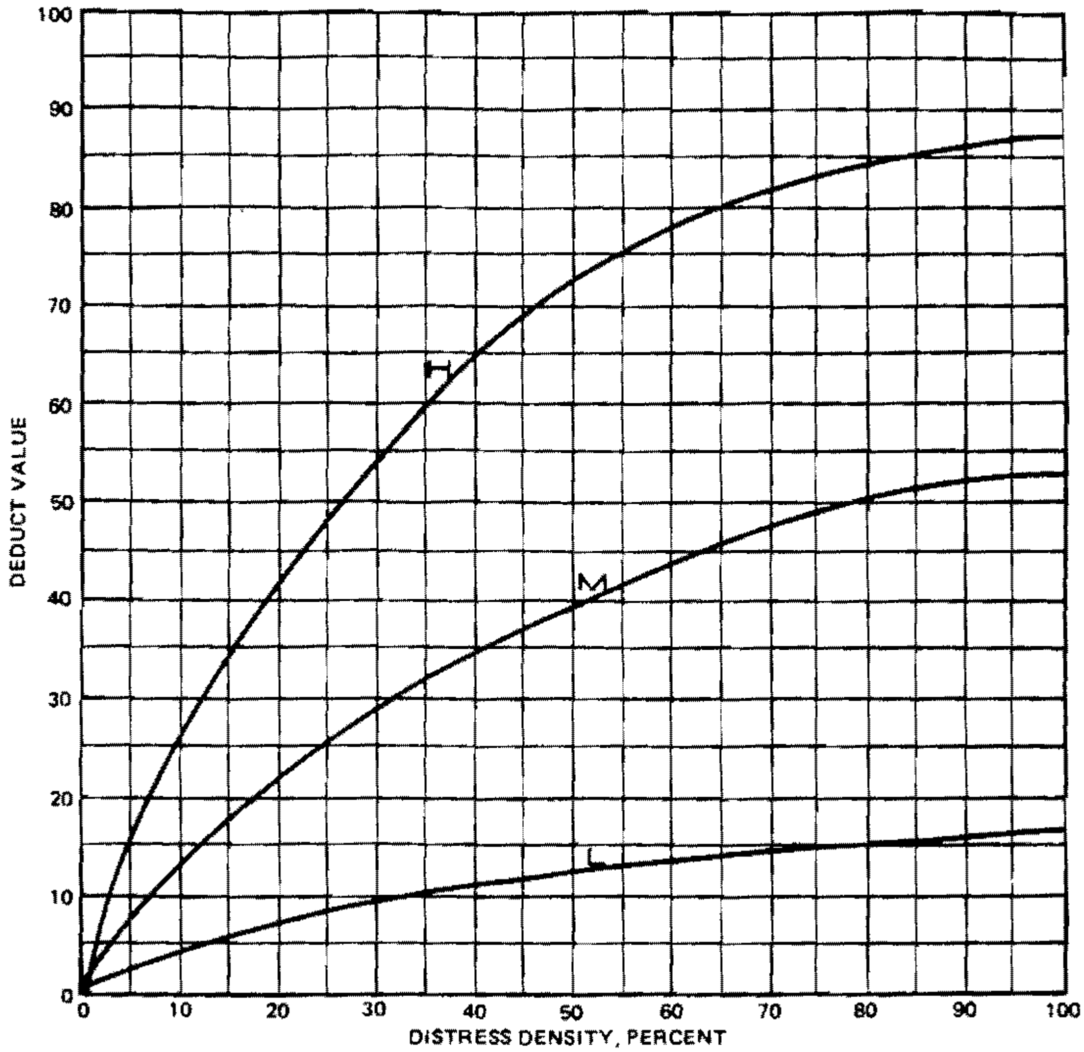

Figure A-19. Rigid pavement deduct values,
distress 10, scaling

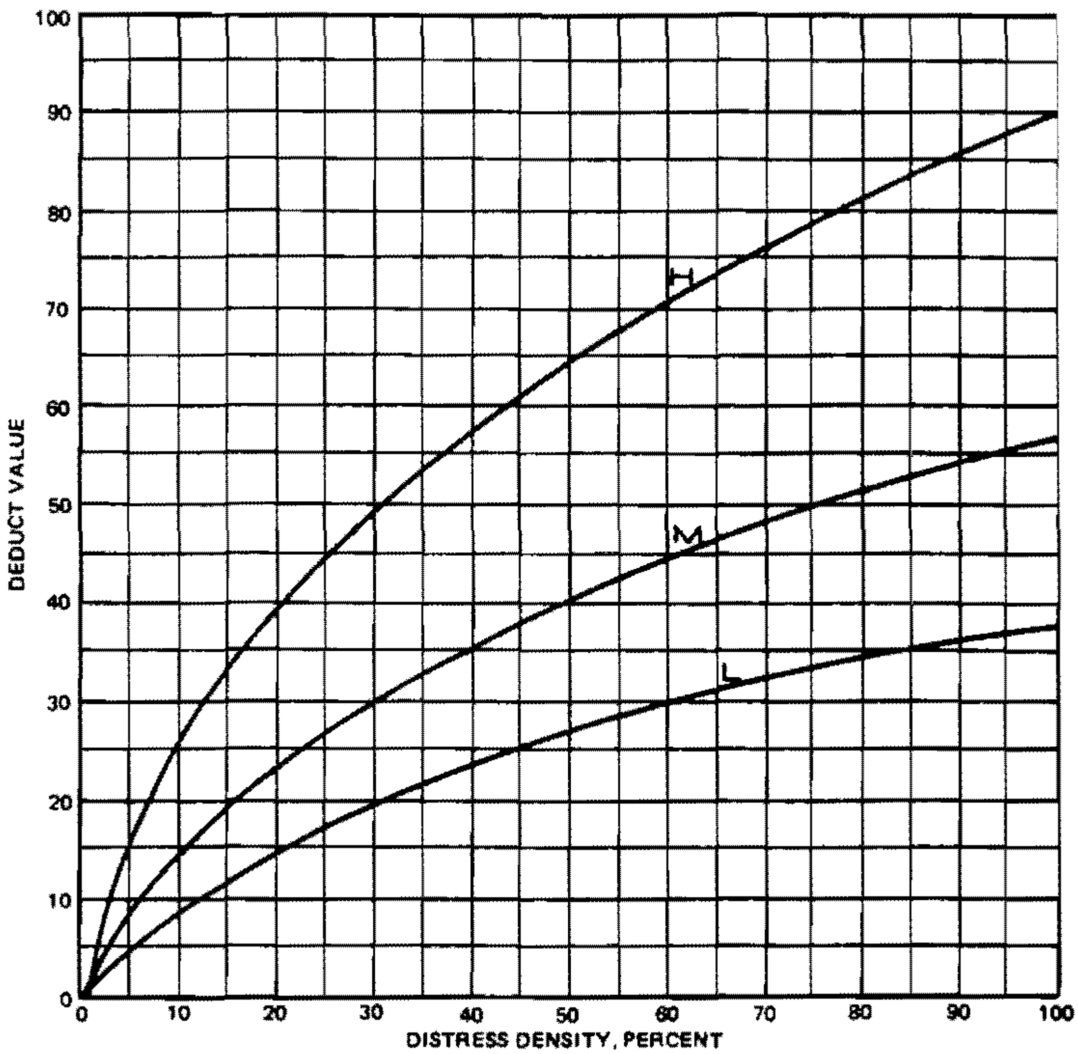

Figure A-20. Rigid pavement deduct values, distress 11, settlement

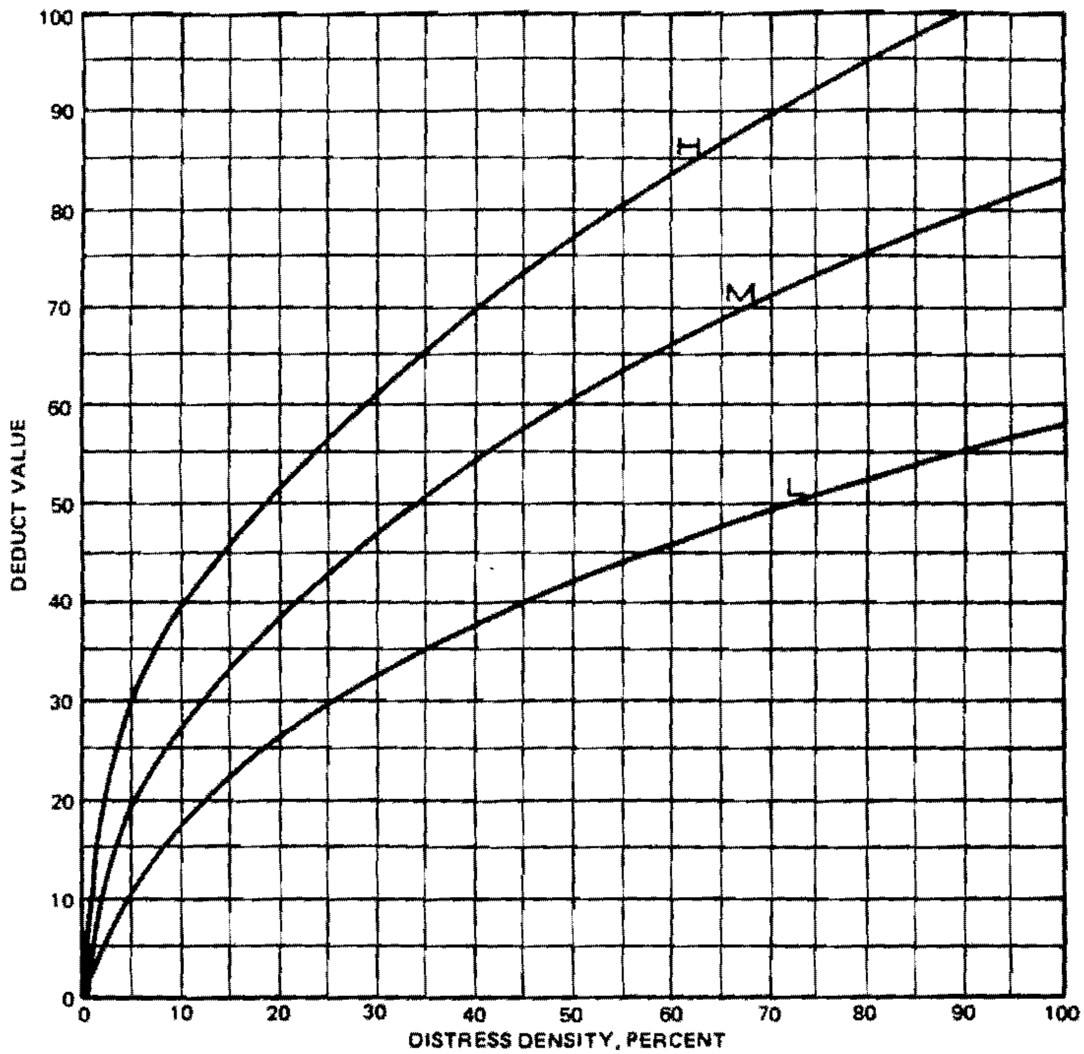

Figure A-21. Rigid pavement deduct values, distress 12, shattered slab

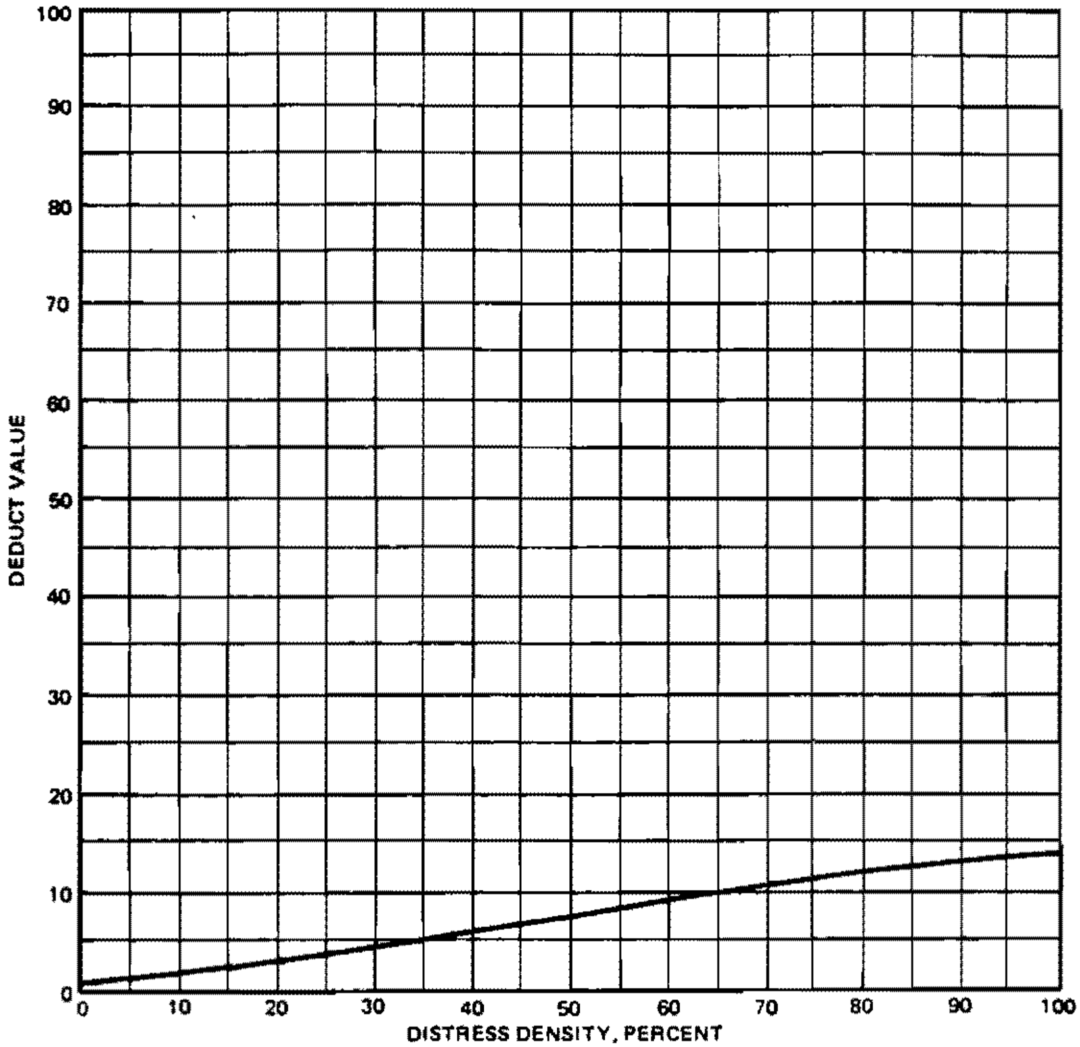

Figure A-22. Rigid pavement deduct values, distress 13, shrinkage cracks

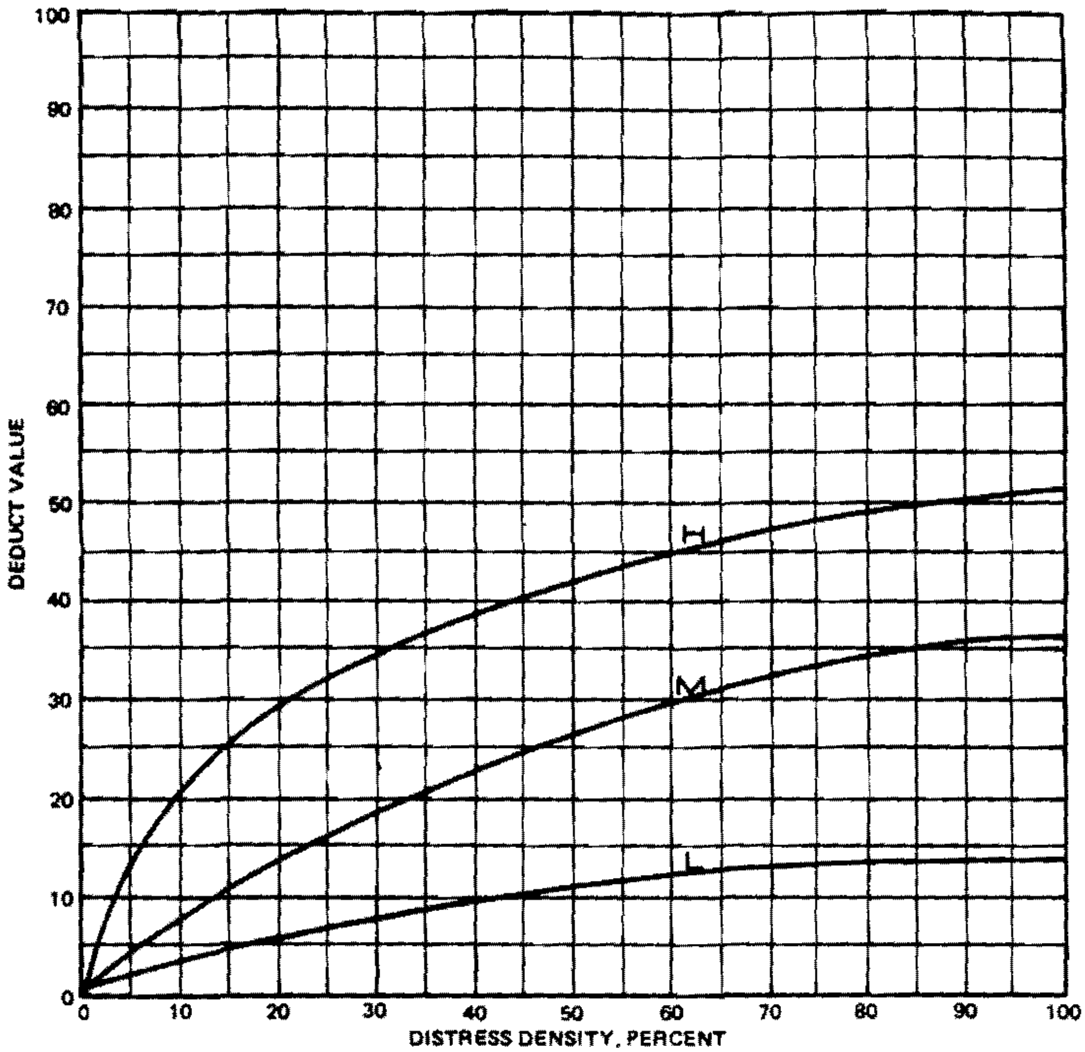

Figure A-23. Rigid pavement deduct values, distress 14, spalling along the joints

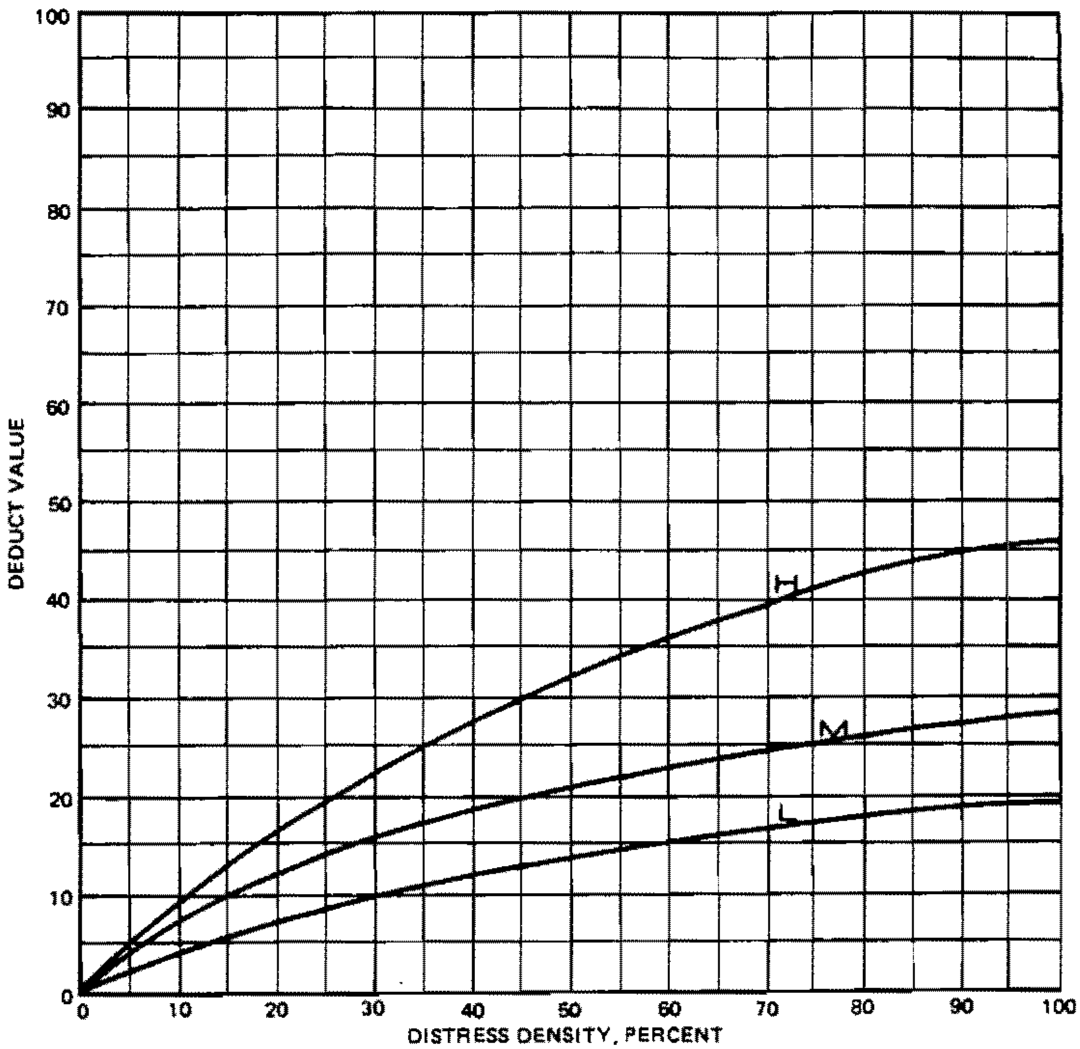

Figure A-24. Rigid pavement deduct values, distress 15, spalling corner

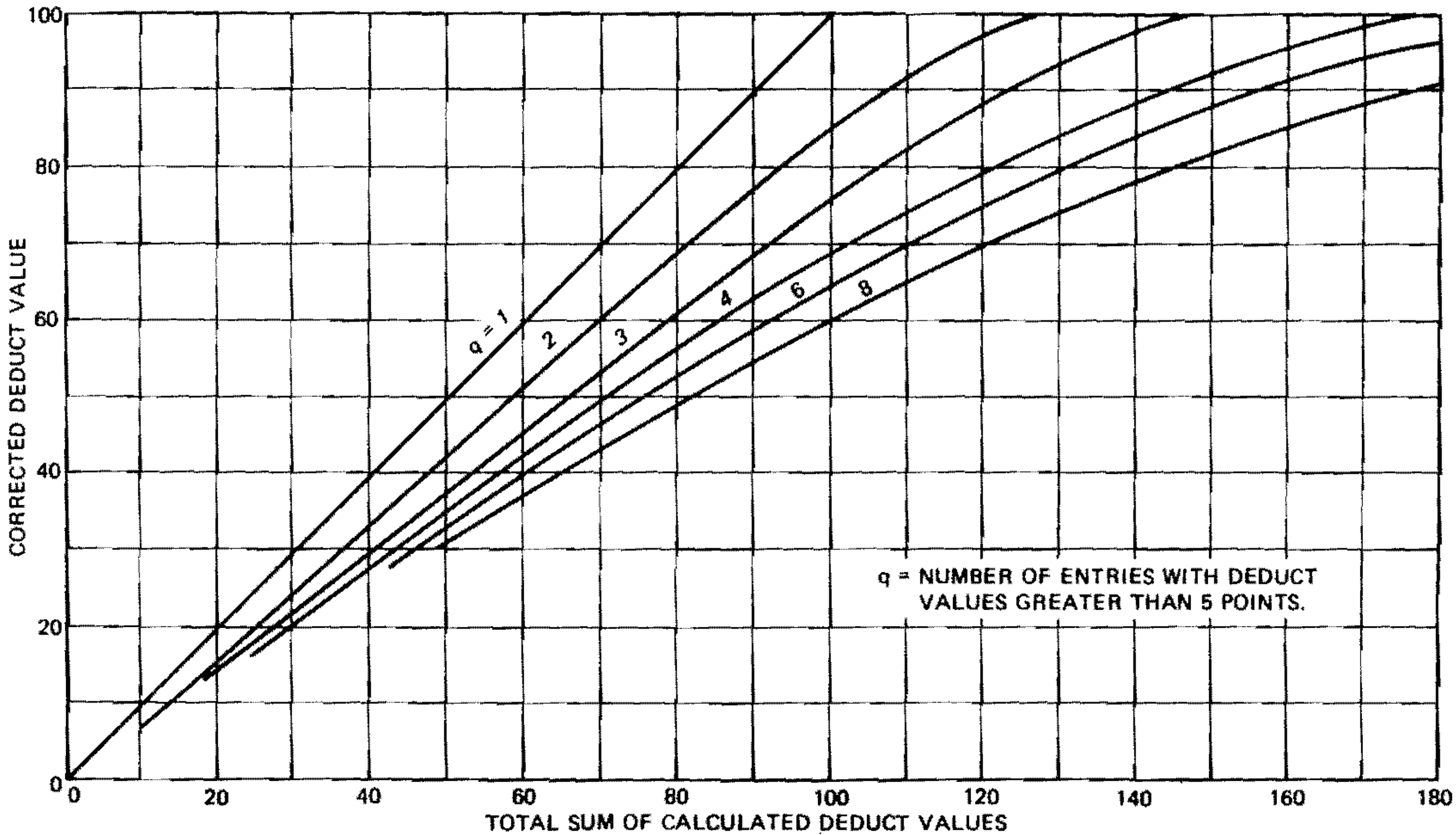

Figure A-25. Corrected deduct values for jointed rigid pavements

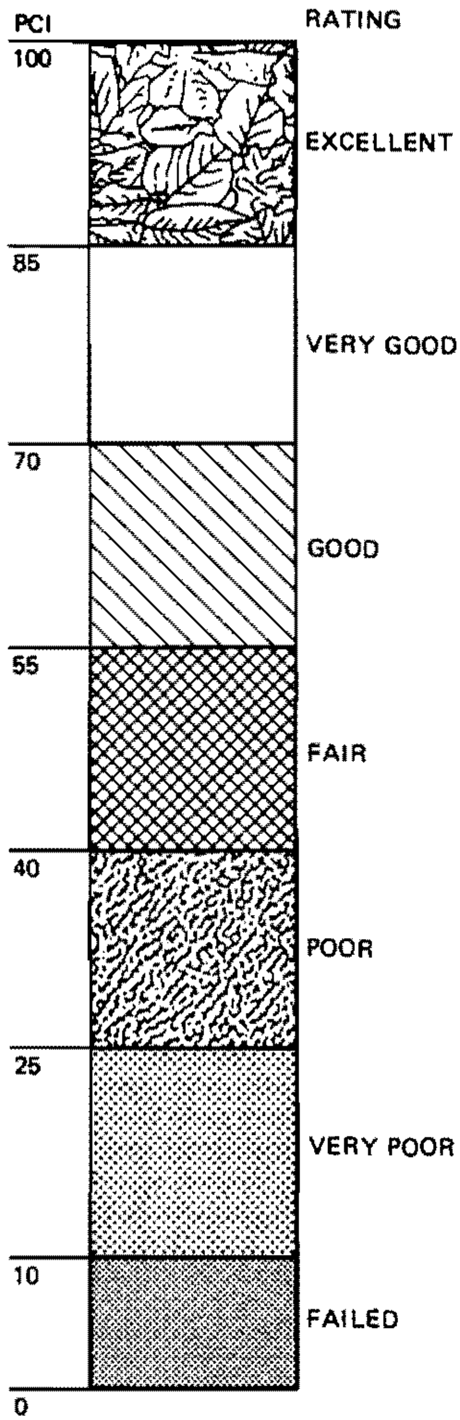

Figure A-26. Airport pavement condition index (PCI) and rating

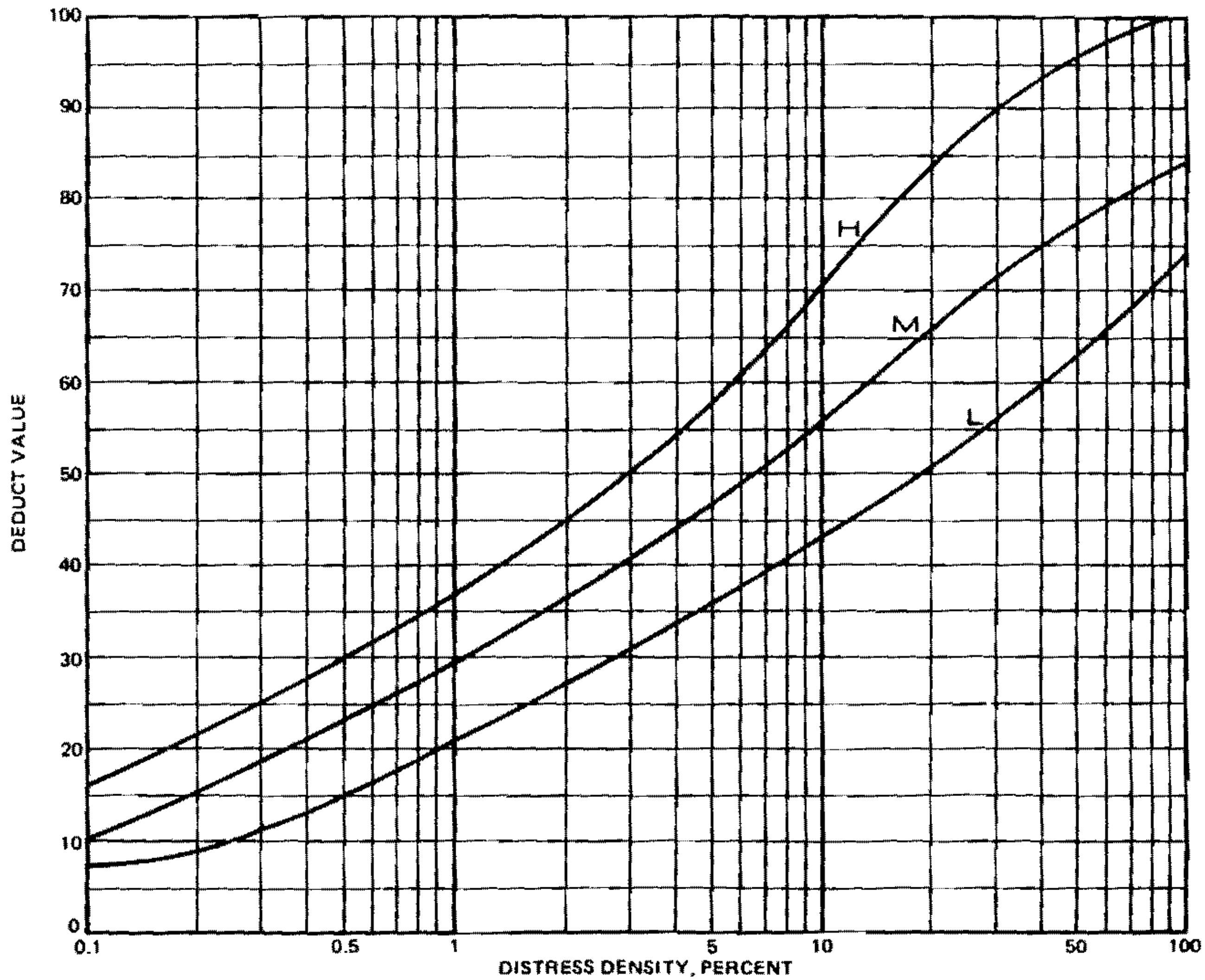

Figure A-29. Flexible pavement deduct values, distress 1, alligator cracking

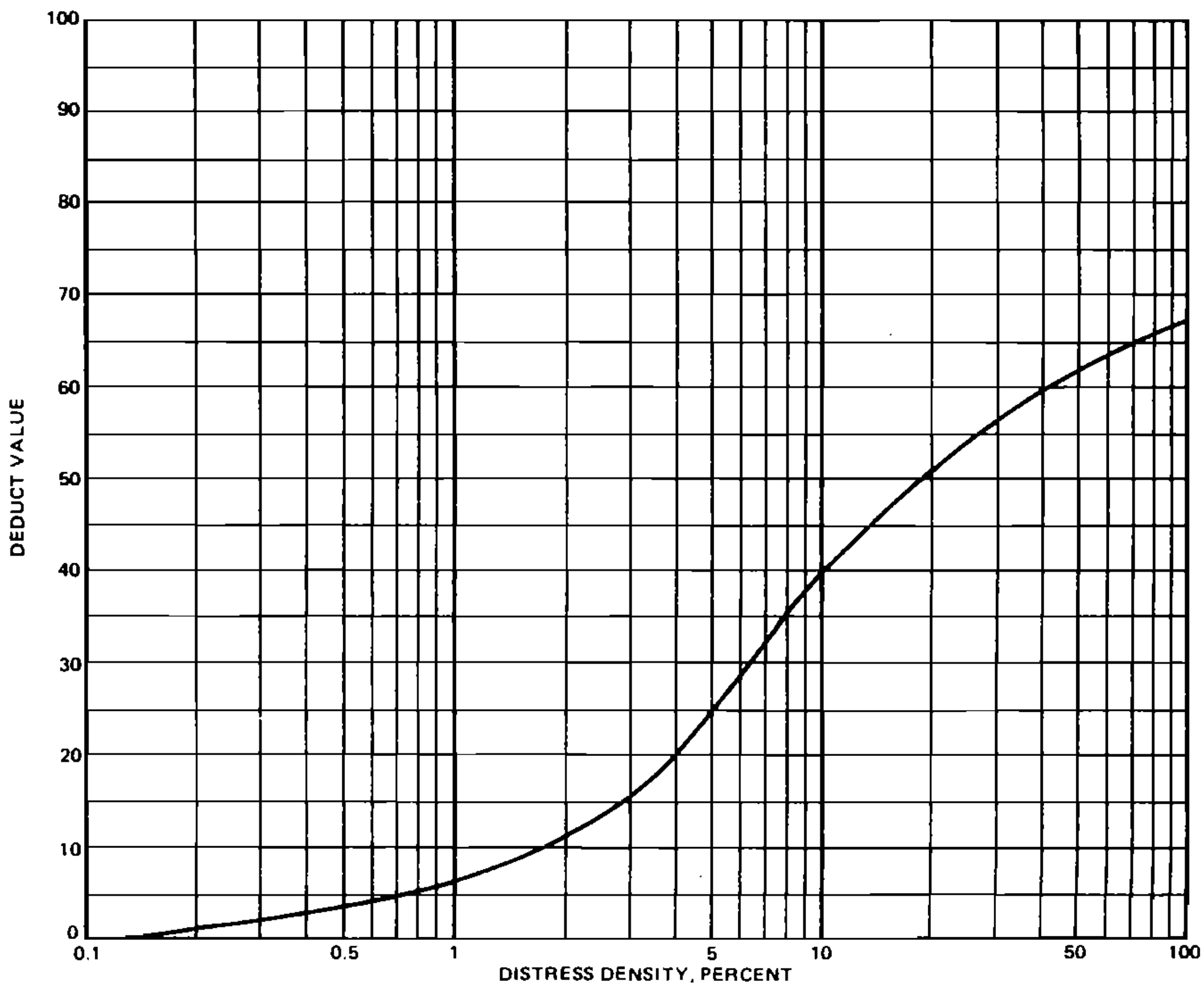

Figure A-30. Flexible pavement deduct values, distress 2, bleeding

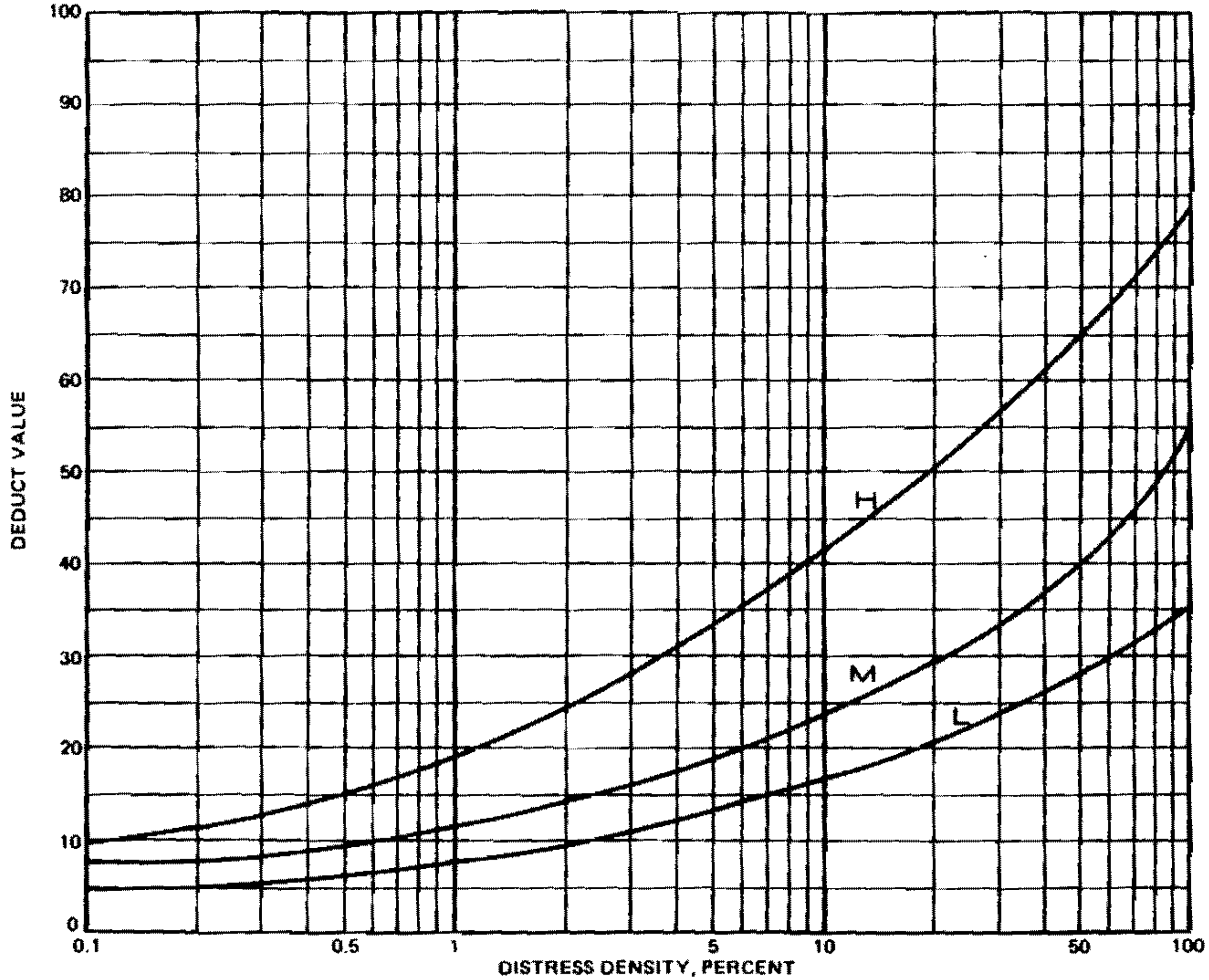

Figure A-31. Flexible pavement deduct values, distress 3, block cracking

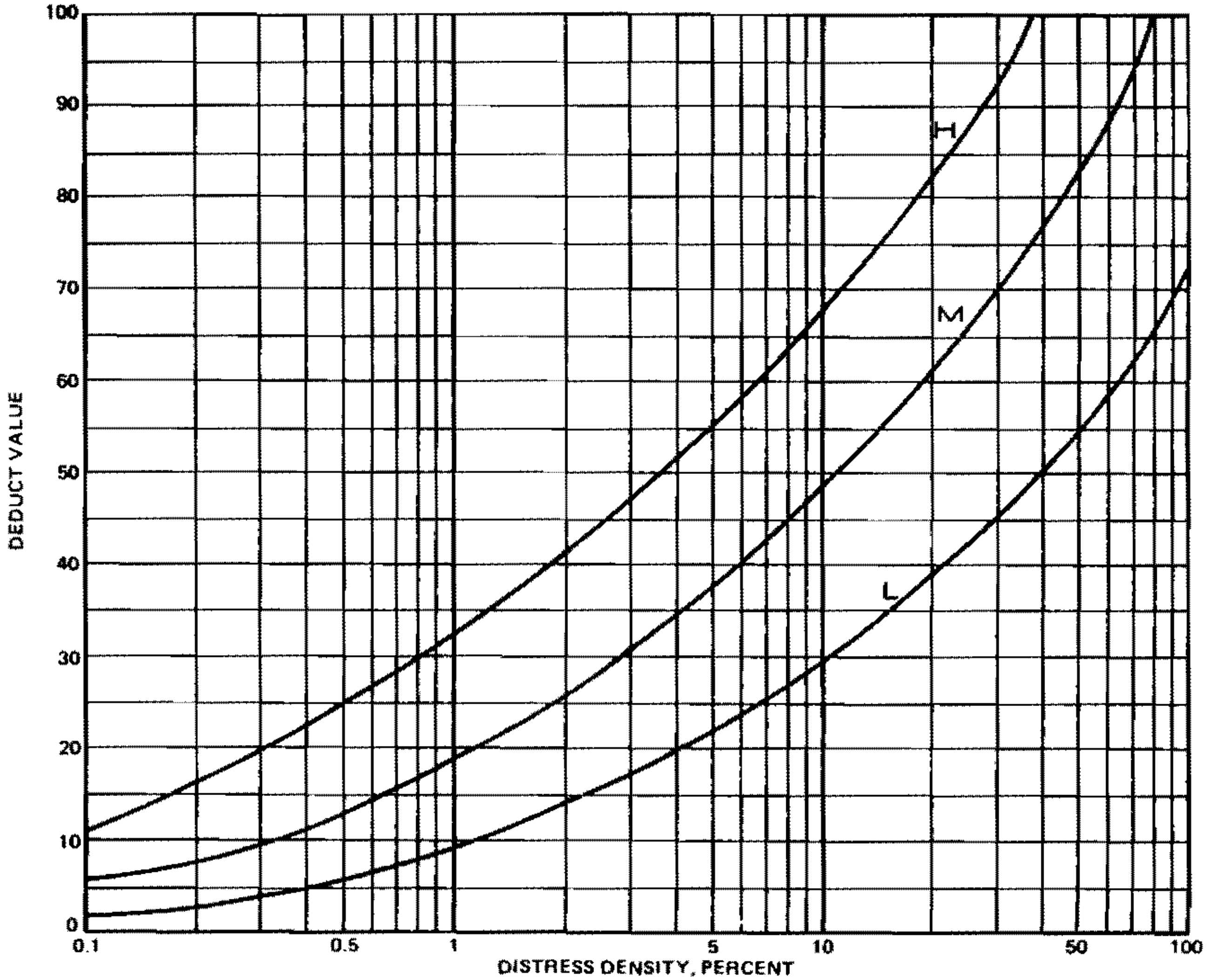

Figure A-32. Flexible pavement deduct values, distress 4, corrugation

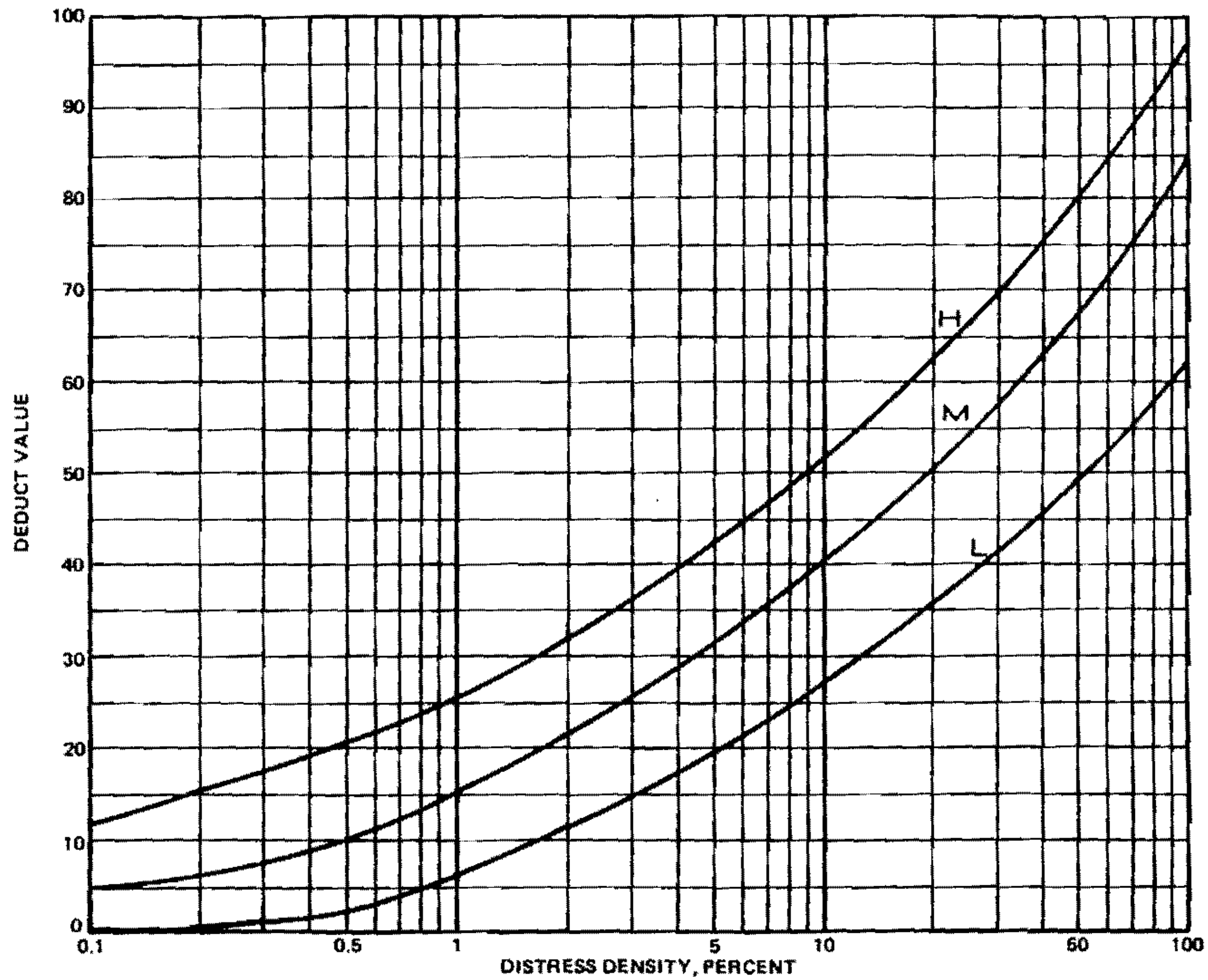

Figure A-33. Flexible pavement deduct values, distress 5, depression

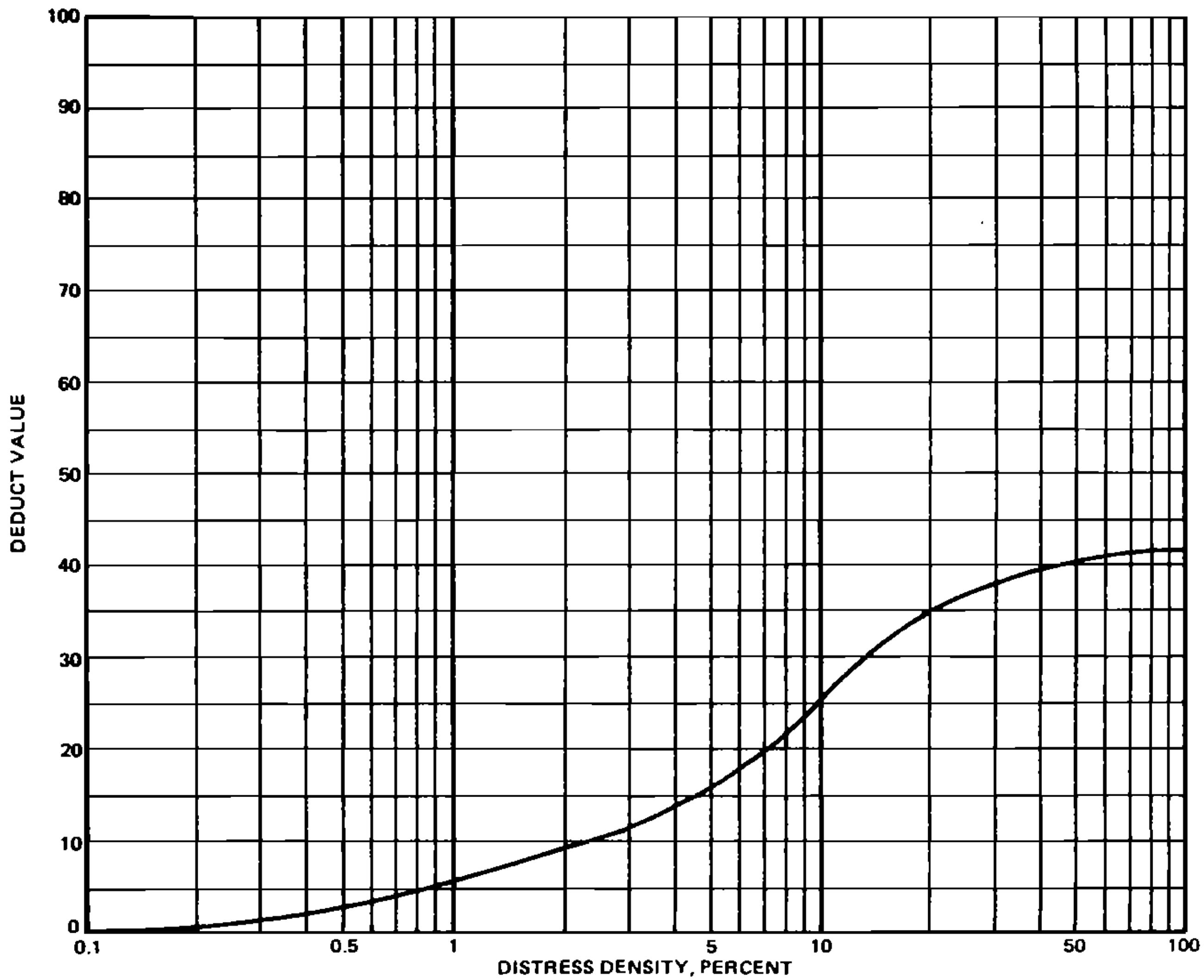

Figure A-34. Flexible pavement deduct values, distress 6, jet blast erosion

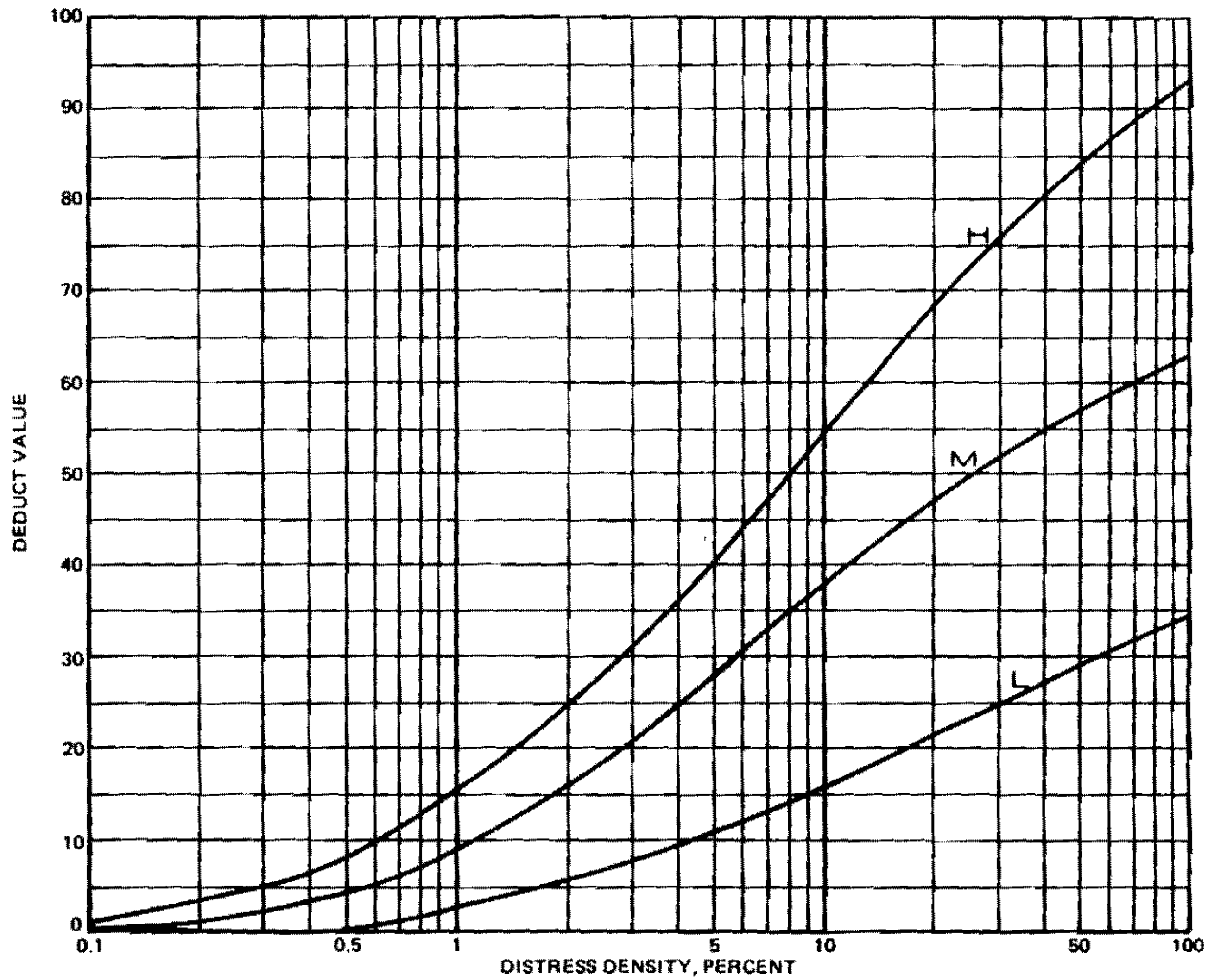

Figure A-35. Flexible pavement deduct values, distress 7, joint reflection cracking

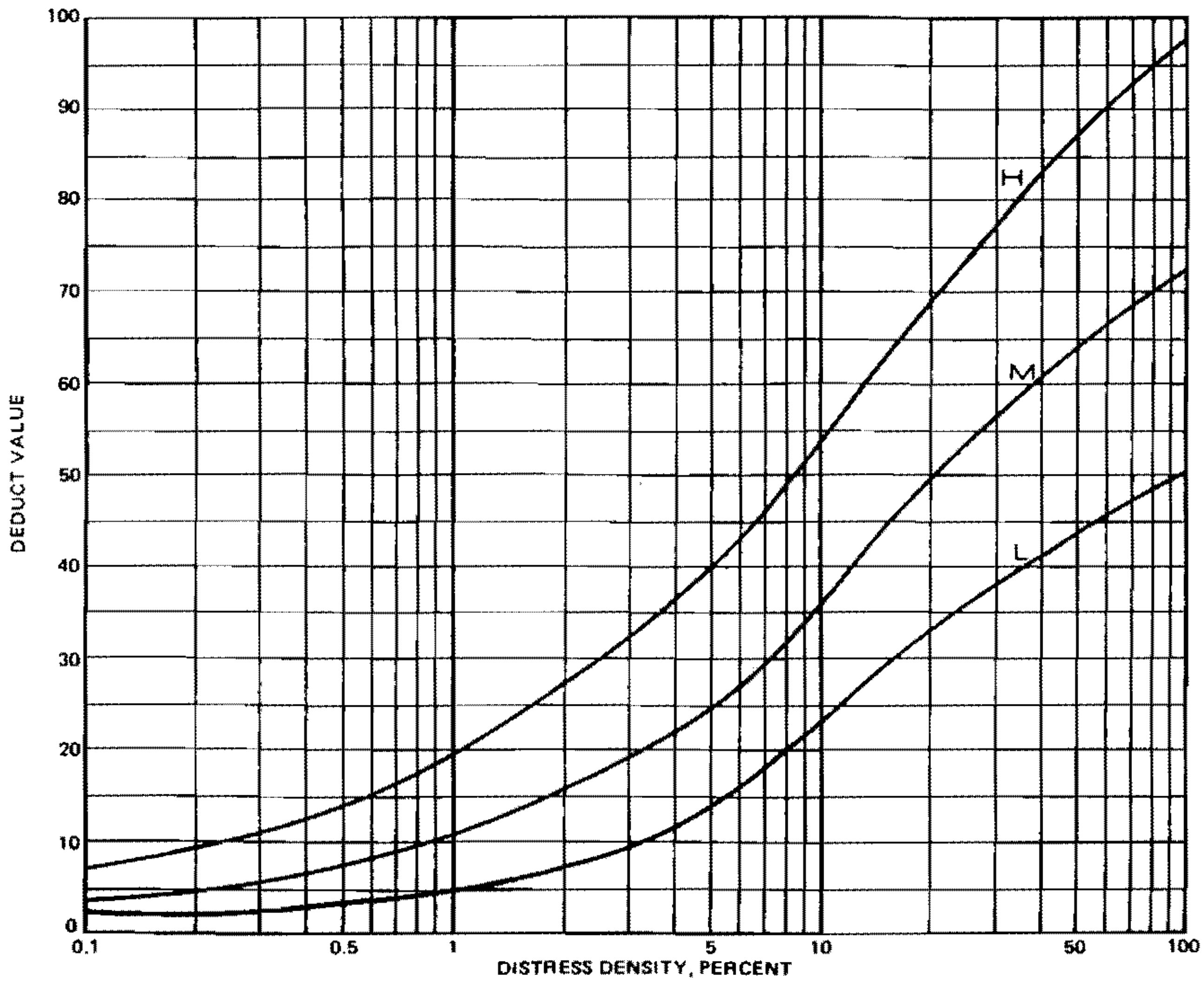

Figure A-36. Flexible pavement deduct values, distress 8, longitudinal and transverse cracking

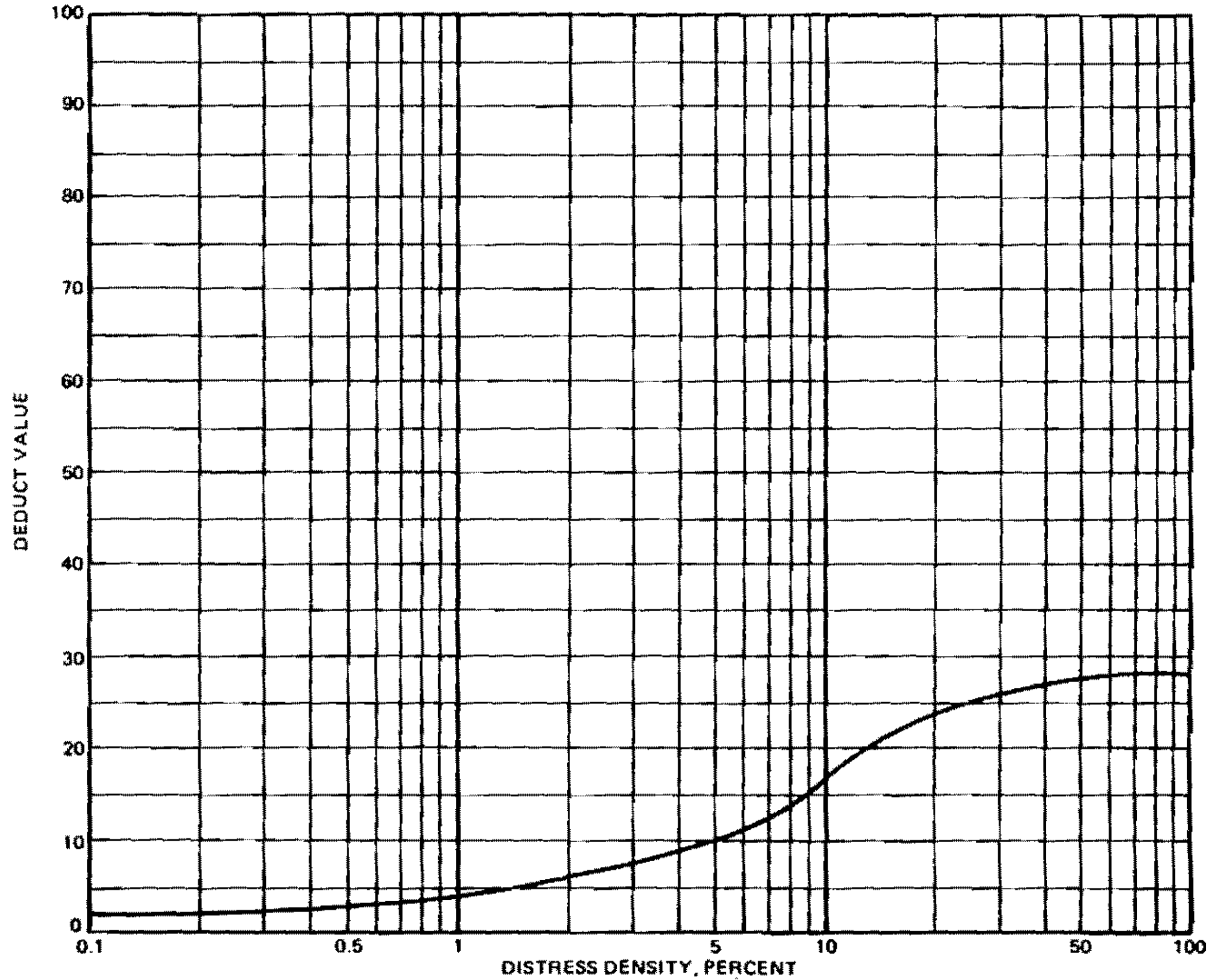

Figure A-37. Flexible pavement deduct values, distress 9, oil spillage

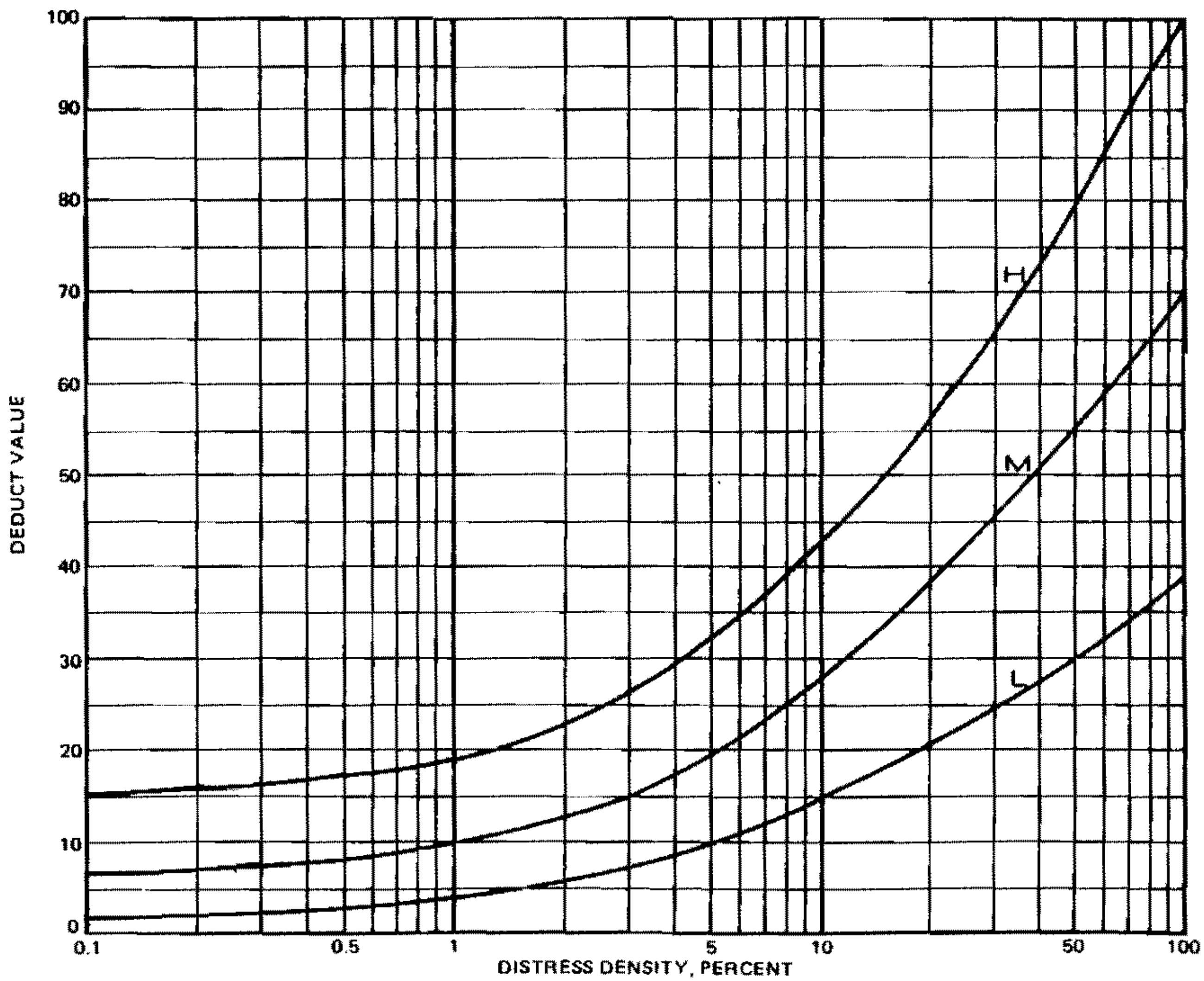

Figure A-38. Flexible pavement deduct values, distress 10, patching and utility cut

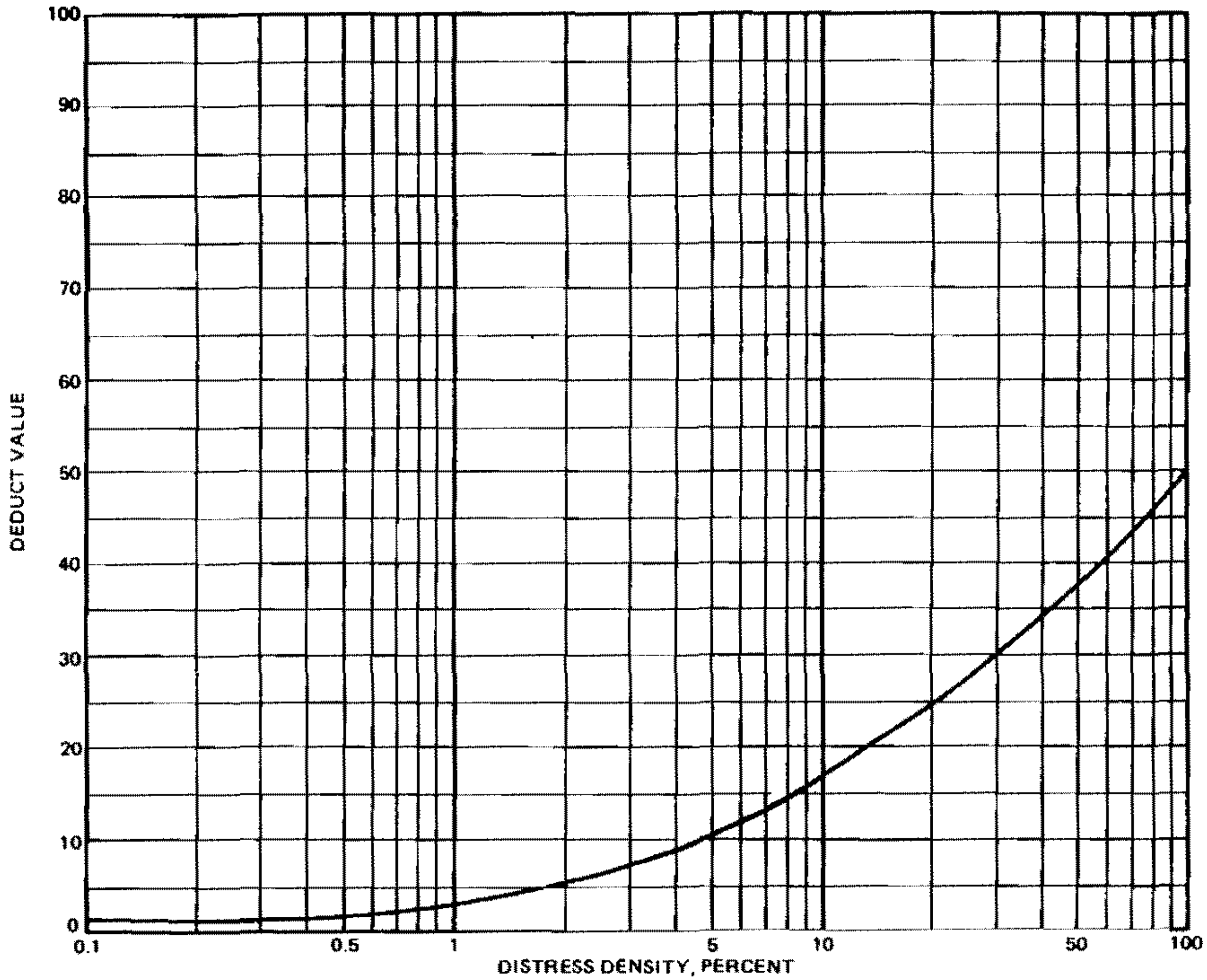

Figure A-39. Flexible pavement deduct values, distress 11, polished aggregate

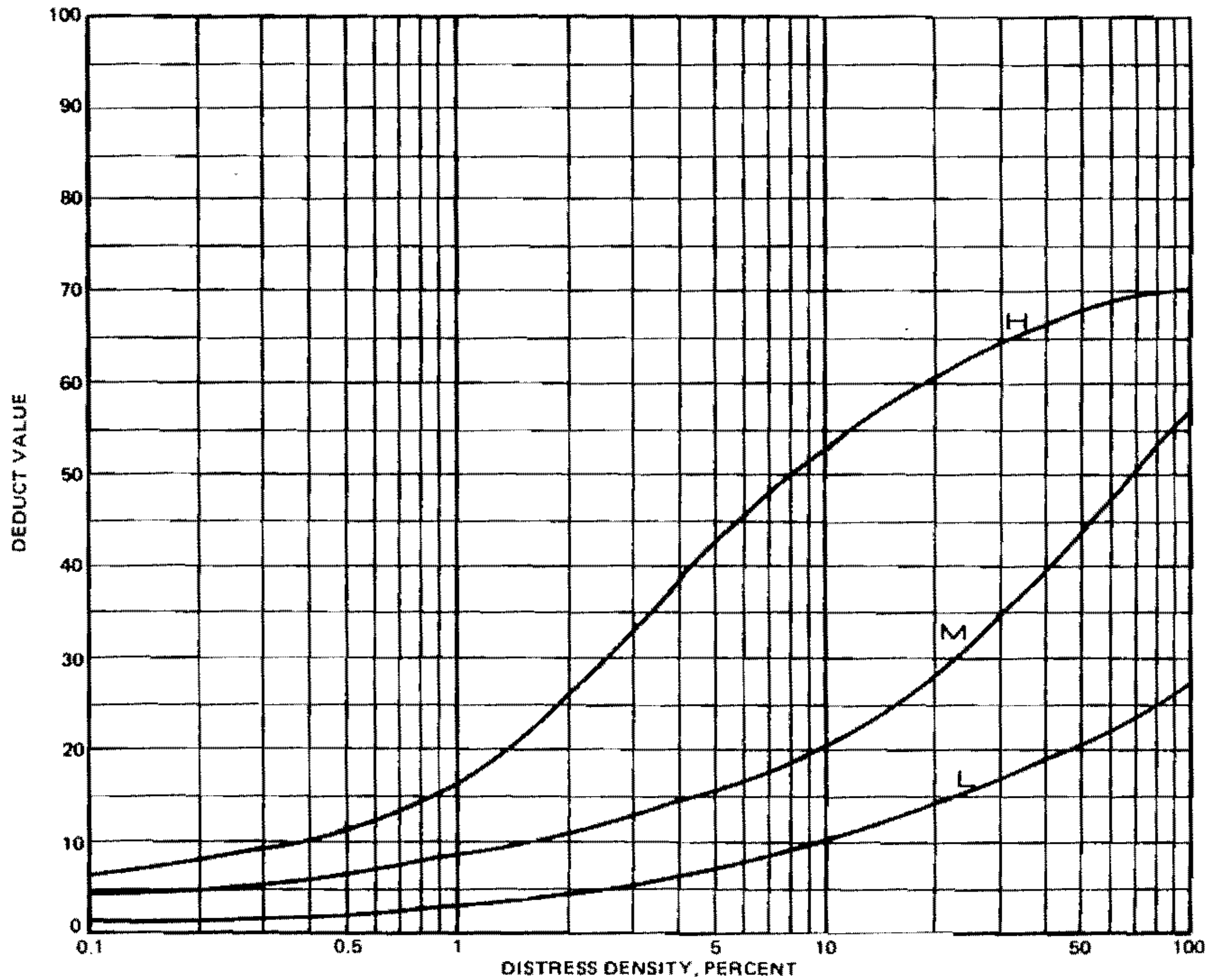

Figure A-40. Flexible pavement deduct values, distress 12, raveling/weathering

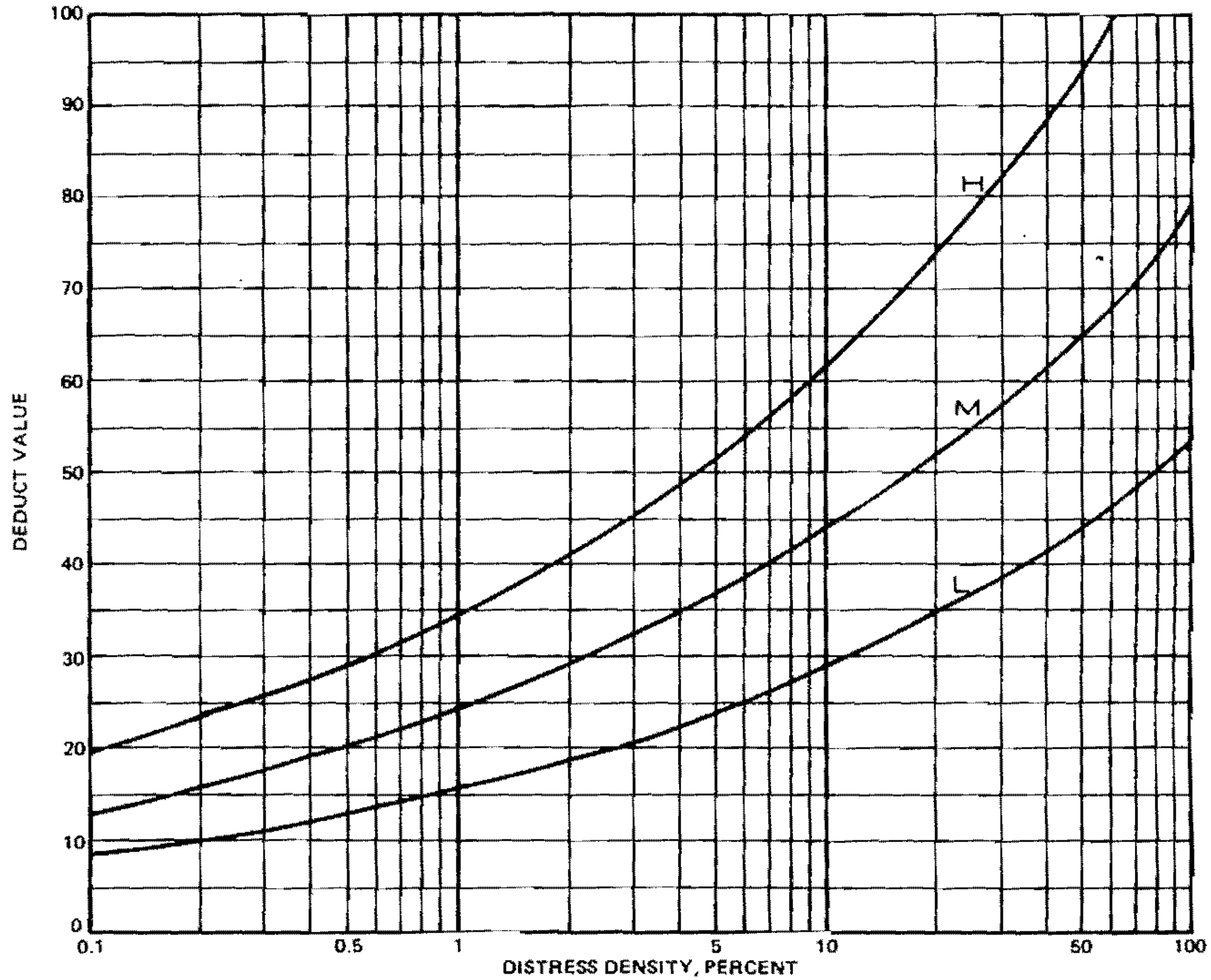

Figure A-41. Flexible pavement deduct values, distress 13, rutting

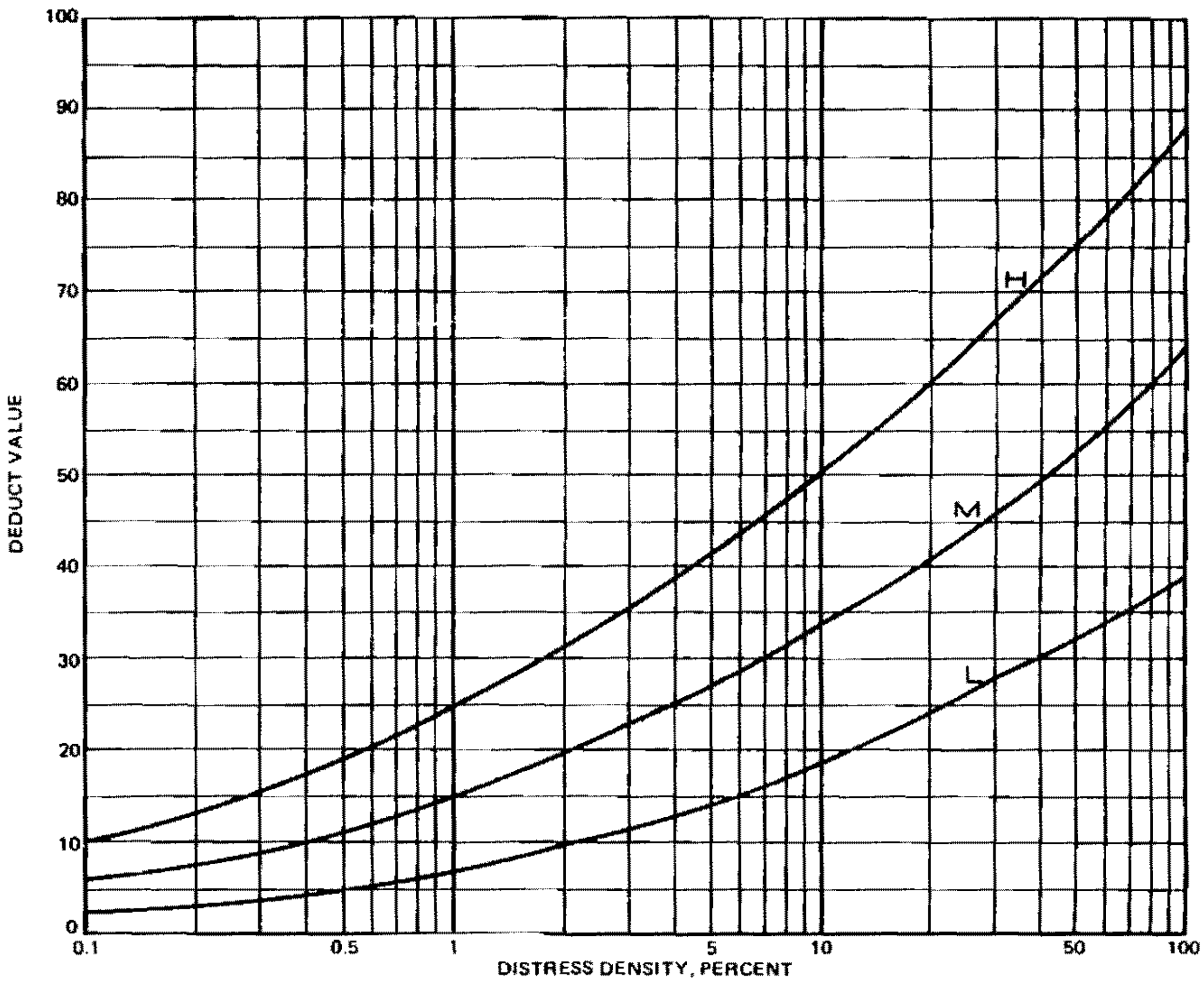

Figure A-42. Flexible pavement deduct values, distress 14, shoving of flexible pavement by PCC slabs

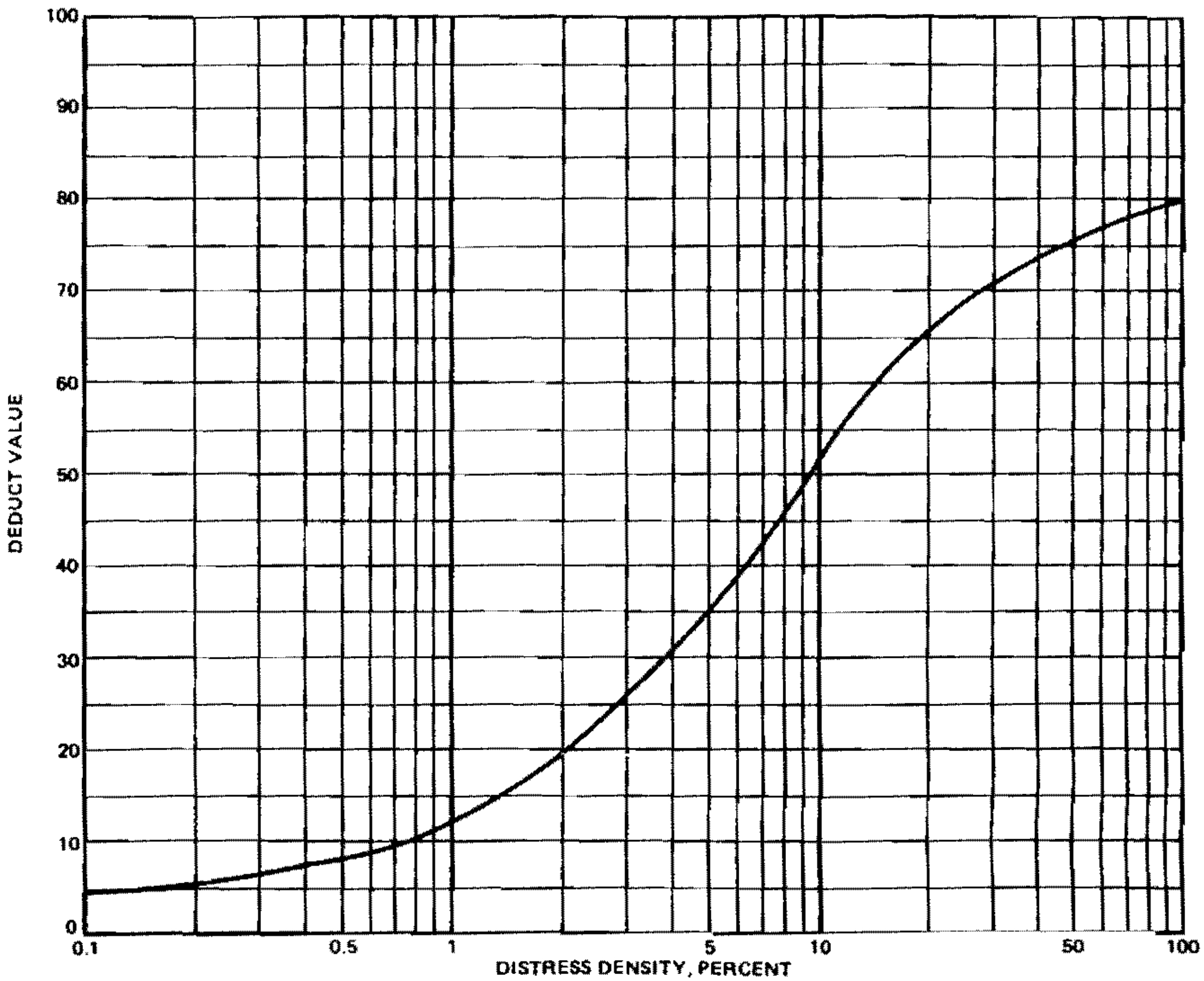

Figure A-43. Flexible pavement deduct values, distress 15, slippage cracking

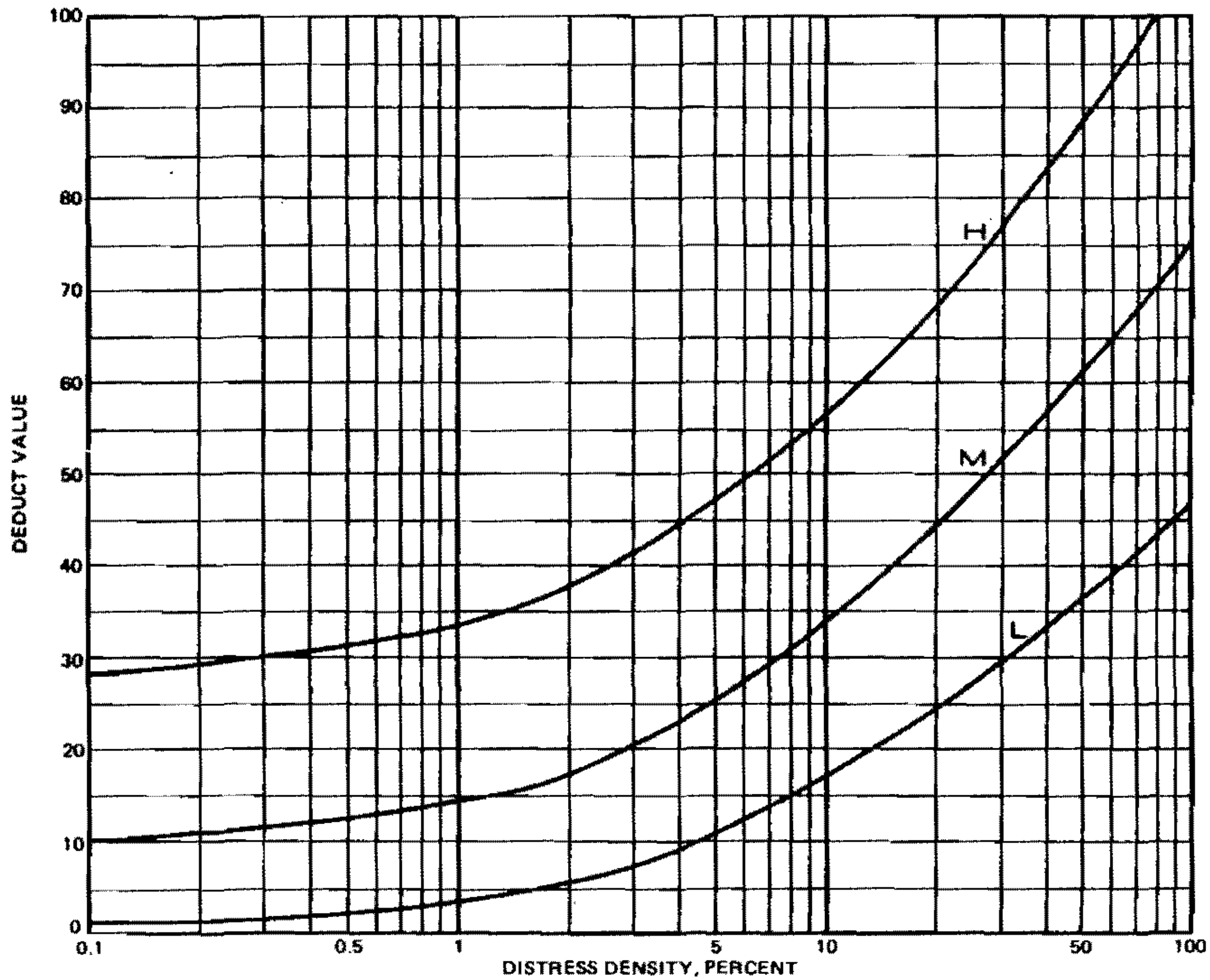

Figure A-44. Flexible pavement deduct values, distress 16, swell

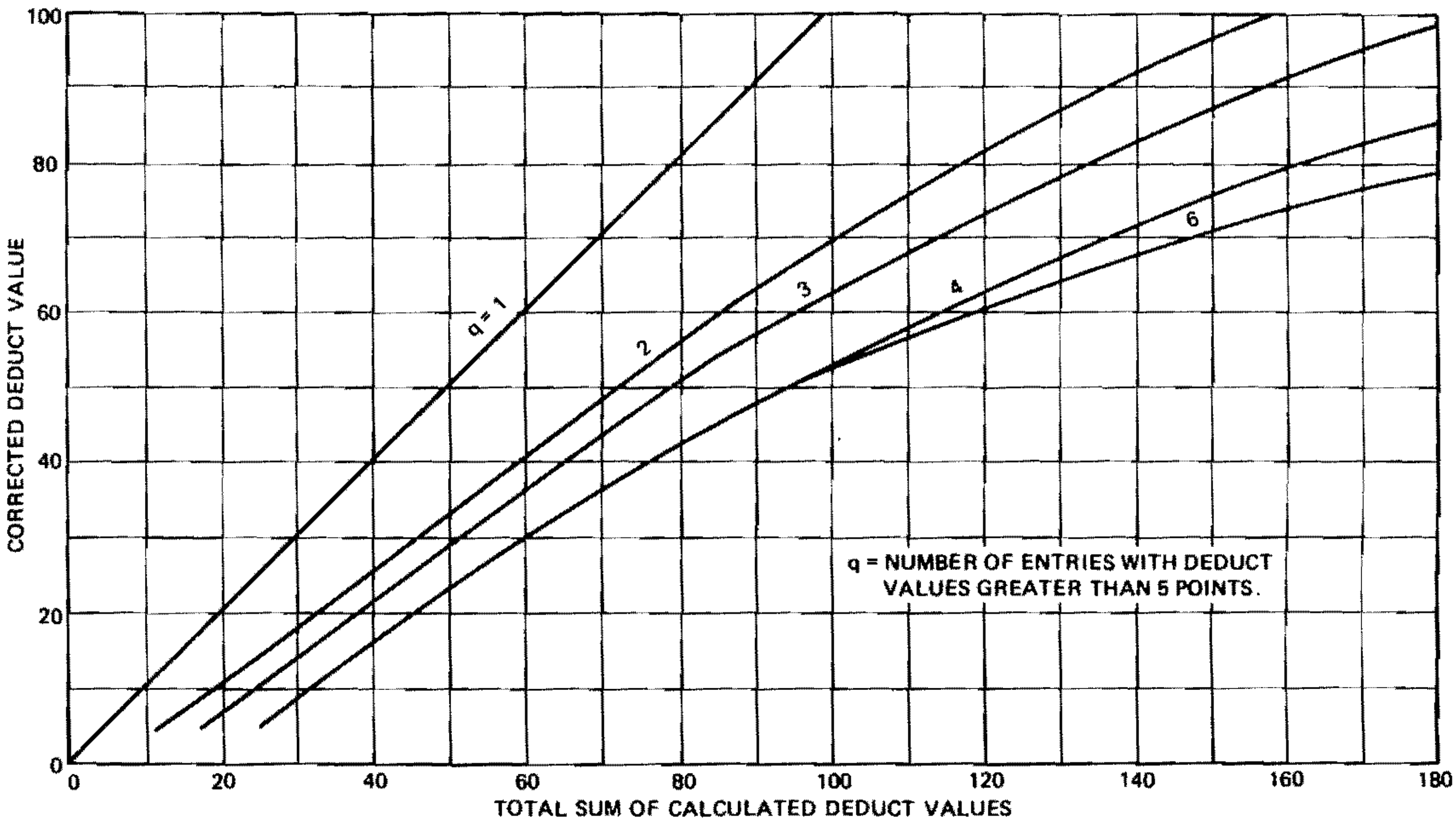

Figure A-45. Corrected deduct values for flexible pavements

PROGRAM OUTLINE

EFFECTIVE PAVEMENT MANAGEMENT

Tuesday, April 23

12:00 Registration

12:30 Introductions & Course Overview

Introductions and welcome. Discussion of the purpose and content of the program.

1:00 History and Importance of Pavement Management

Review of traditional methods used by engineers to assess pavement conditions. Examples of shortcomings of such methods. Emphasis on importance of documenting and justifying budget requests.

1:30 PCI and Other Pavement Evaluation Systems

Summary of traditional destructive and non-destructive testing techniques. Introduction to PCI method of pavement inspection and PCI terminology used in Pavement Management Systems. Importance of consistency in data collection. Value of computers in data processing.

2:30 Break - Questions & Answers

3:00 Use of Computers in Pavement Management

Explain the evolution of pavement management software. Discuss what information pavement management software should provide the user in order to facilitate decision making.

3:30 AIRPAV -- Eckrose/Green Advanced Pavement Management Software.

Present AIRPAV programs to explore how pavement condition information can be utilized to generate effective decision making information.

4:30 Adjourn

5:00 Eckrose/Green-Donohue will provide transportation to Brewers-Rangers game.

PROGRAM OUTLINE

PCI INSPECTOR TRAINING COURSE

Wednesday, April 24

7:30 Coffee & Doughnuts

8:00 Introduction & Course Overview

8:15 PCI Method of Pavement Evaluation

Describe the PCI method of pavement evaluation. Show how a PCI is calculated for both flexible and rigid pavement. Mention that a PCI survey provides more than just a numerical rating, and relate this concept to the importance of accurate distress identification and measurement.

8:45 Pavement Network Layout

Step by step presentation of the importance of accurate sketches and construction history. Show how sketches are developed, beginning with an outline, and adding sample units and features. Mention that identification of features continues throughout the project. Present standard Feature and Sample Unit identification procedures. Show alternative numbering techniques. Emphasize the inspectors role in verifying and making modifications on site.

9:30 Break - Questions & Answers

10:00 Pavement Dynamics and Introduction to Distress Types

Present pavement dynamics, in general, as summarized in Chapter 4 of our manual, "Airport Pavement Inspection by PCI". Then introduce distress types for flexible and rigid pavement, and present the pavement dynamics contributing to each distress.

10:30 Tools of the Trade

Present equipment necessary to perform a pavement condition survey by PCI, and discuss the importance of each item presented.

10:45 Identifying and Measuring Distresses

Slide presentation of various distresses, followed by discussion of type, severity, and measurement.

12:00 Lunch

1:00 Identifying and Measuring Distresses (con't)

2:30 Break Questions & Answers

3:00 Safety on Airports

Discussion of operations on the air side. Review of radio procedures. Presentation of differences between controlled and uncontrolled airports. Importance of traffic patterns, approaches, pilots' expectations, noise and distractions, preoccupation, etc. Special considerations on busy uncontrolled airports.

3:15 Preparations for Inspection

Notification of airport Owners, collecting and checking out equipment and supplies. Maintenance of equipment in the field. Dealing with expenses, arranging extended travel schedules and equipment security. Maintaining required sketches, forms, road maps, names and telephone numbers needed for the survey.

3:30 Inspector Responsibilities On-site

Summary of team duties, including notice to Owner, sample unit layout, and inspections. Emphasis in inspector responsibilities to analyze layout for inaccuracies or possible improvements. Discussion of production versus quality, emphasizing that inspectors can achieve both by carefully evaluating each feature for probable distress types, and by knowing severity criteria cold.

3:45 Exam
Fifty slides of pavement distress will be shown. Each will be illuminated for one minute. Participants will identify each distress and severity.

4:45 Critique
5:00 Adjourn to Hospitality Room

PROGRAM OUTLINE

PCI FIELD PRACTICE & DATA REDUCTION

Thursday, April 25

8:00	Depart for Mitchell Field
8:30	Security & Safety Briefing
9:00	PCI Pavement Inspections
11:30	Depart Airport
12:00	Lunch
1:00	PCI Calculations
2:00	Break
2:30	Using PCI Information for Pavement Management
3:30	Adjourn

AIRPORT PAVEMENT MANAGEMENT
ECKROSE/GREEN ASSOCIATES, INC.

6409 Odana Road
Madison, WI 53719

MAKING PAVEMENT MANAGEMENT TECHNOLOGY WORK FOR YOU

William H. Green

A BRIEF HISTORY

From the end of WWII to about 1960, we were a society dedicated to expansion and growth. There seemed to be no limits. When a building, or a road, wore out we replaced it. Maintenance and preservation efforts were pretty much relegated to the maintenance crew or janitor. It just wasn't a subject the bosses spent a lot of time worrying about. Then, during the '60s, there came a conflict of priorities between technology and environment. Society began to take a critical look at what our growth was costing us.

When our economy got out of control in the '70s, even the bosses had to take note. There just wasn't enough money to do everything because new construction was taking huge chunks out of the budget. And even when funds were available, environmentalists and other concerned citizens often made progress impossible. So the next reality was to take better care of our resources.

The first step was to simply cut back on expenditures, "tighten the belt", and make do. Well, that didn't work out for very long, because things started to break down. Then we turned to our maintenance crews and janitors. "Fix it!" we cried, expecting that these unassuming, dedicated people would be able to perform miracles.

Then we went through a period when we took it out of our own hides. "Turn the thermostats down!" was the battle cry of the mid '70s. "Drive 55!" we said. "Save energy." "Make budget cuts." "Defer maintenance." We thought we could keep the wolf away from the door by being more efficient - by suffering a little - by making do with less.

WHY MANAGE THE PAVEMENT SYSTEMS

Most of us have learned that cold fingers can't type efficiently, that people at home sick don't contribute to an organization's goals, that 55 takes longer to get there, that maintenance crews can't perform miracles, and that old facilities keep getting older.

So what is the answer? We simply have to do a better job of preserving our resources. We have to get more value out of the money we spend. We have to use our money where it will do the most good. We have to manage our systems.

The concept of Pavement Management is not new. In fact, people responsible for pavement systems have been managing them, after a fashion, since the first pavement was placed back in Egypt, or Rome, or wherever. The idea has always been to assess the ability of pavement to perform its function and to predict when something will have to be done to restore it to serviceability. The traditional means has been to examine the pavement system periodically and decide which area needs attention first. Then those doing the examination decide what should be done and estimate how much it will cost. Then a budget is submitted for all, or part of, the needed funds. Typically, the budget suffers several trimmings enroute to approval, and the pavement people take what they get and do as much as there is money for.

These are not satisfactory techniques for defining and estimating projects on airports. The dynamics of pavement deterioration are complex, and rehabilitation is costly. Committing money to a project based on a brief description and a "wag" estimate is unconscionable. The taxpayers deserve better, and they are demanding better.

The investment we have in pavement systems in our society is staggering. Virtually all pavement in use today has been constructed in the past fifty years and most of that is more than twenty years old. Oh, we've overlaid and widened some of it, but our pavement system was basically in place twenty years ago. It gets older every year and it just keeps wearing out. The important questions are, "How fast is it wearing out?", "What is the best thing to do about it?", "When does it have to be done?", and "How much is it going to cost?"

Most engineers and administrators responsible for pavement systems inherently know their pavements. They live with them every day and they know what's wrong with them. Most of them think they know what to do.

The problem is, other people hold the strings of the money pouch, and they want to be convinced! They want justification. They want documentation. They want dollars and cents, to the penny. And they want to know what those dollars and cents are going to buy. And they want to know that what is being proposed is the absolute best way for the money to be spent. Most public officials responsible for allocating taxpayers' money don't have a lot of faith in a person's judgement. Businesses and budgets don't function much on faith anymore. The money managers insist that, when they allocate public funds for a project, there will be sufficient documentation to justify their actions against criticism by the their constituents.

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ESTABLISHING A PAVEMENT MANAGEMENT PROGRAM

Fortunately, technology is now available to determine, with confidence, what a pavement system's needs are, and when they are needed, and how much they will cost. This technology includes many evaluation techniques, such as destructive and nondestructive testing, friction testing, standardized pavement inspection procedures, and a host of "Star Wars" techniques, several of which are still experimental. Many of these techniques are only feasible due to recent advancements in computer science.

These techniques have any number of specialized functions, and no one technique can give all the answers but, used in proper combination, they give us a surprisingly accurate picture of pavement dynamics. This is not a "black box" technology, it is engineering raised to a higher power through availability of these new tools.

A Pavement Management Program for an airport should be specifically designed for that airport's pavement system. This will assure that the User does not pay for more or less than is required, and that the right technology and management tools are acquired. Further, the program should be constructed so that, to the greatest possible extent, it can be maintained by the User.

In overview, a comprehensive Pavement Management Program should integrate appropriate technologies which should encompass at least the following elements, molded into a program that is right for the User.

* System Inventory
* Visual Inspection
* Nondestructive Testing
* Other Testing
* Integration and Evaluation of Data
* Capital Expenditure Planning
* Maintenance Programming

A brief discussion of each of these elements follows.

System Inventory

This element of the program consists of assembling a record of pavement history including type, age, construction characteristics and major traffic considerations. The inventory leads to identification of discrete pavement "sections" having generally similar characteristics. This process of subdividing pavement allows inspection, testing and evaluation work to be focused more effectively, and facilitates identification of unusual or uncharacteristic conditions.

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Visual Inspection

Visual inspection is, in reality, an element of the data collection phase of a system inventory. It is the oldest form of pavement condition evaluation. Engineers have been evaluating pavement by this method since shortly after the first pavement was constructed. The greatest difficulty with visual examination has always been the subjective nature of the process.

In recognition of this limitation, an objective system of examination has been introduced which is rapidly becoming a "de facto" standard for visual inspection. This system is designed to establish a Pavement Condition Index (PCI) for each distinct pavement "section", and is known as the PCI procedure. The procedure was developed by the Army Corps of Engineers and has been adopted by the Federal Aviation Administration (FAA) for use on civil airports.

The Pavement Condition Index is based on a number of distinct distress types commonly found in pavements, and the PCI procedure objectively defines the type, quantity and severity of these distress types. This data is then converted by formula to a numerical rating between zero and 100, with 100 being a perfect pavement and zero being a totally failed pavement. Accordingly, the procedure affords the User a standard index of pavement condition not available in any of the more subjective inspection procedures.

There are three primary objectives for a pavement condition survey. The first is to measure existing conditions. The second is to assure consistent results. The third is to provide a common index for comparison of pavement sections in a system. The PCI procedure fulfills these objectives and, in addition, offers evidence of several primary determinants of pavement condition, such as:

1. Structural adequacy
2. Roughness
3. Friction characteristics
4. Rate of deterioration
5. Maintenance effectiveness

PCI inspection provides data for alternative analysis, service life forecasts, reinspection comparisons, and evaluation of pavement deterioration over time. PCI data also provides definitive information of pavement condition for use in capacity analysis.

Nondestructive Testing

There are many kinds of nondestructive testing. Each type has specific applications, and different types are

frequently used to supplement one another. No single technique, however, can provide all the data necessary for a comprehensive, effective Pavement Management Program.

Nondestructive techniques frequently employed in pavement evaluation/management programs include deflection testing, ground penetrating radar, infrared thermography, friction testing and profiling. Each has a specific function and each should be selected according to the specific needs of the pavement system.

Deflection Testing Equipment. Several types of deflection testing devices are in use. In broad terms, they fall into one of three categories: static devices, dynamic devices and impulse devices.

Static devices, typified by the "Benkleman Beam" are simplest to use and are least costly in terms of capital expense. Unfortunately, they are also most limited in application, most inconvenient, and most labor-intensive. Simply put, use of a static device consists of placing a long fixed beam which extends from outside the test area into the area where deflection will be measured. A load is placed in the test area, typically a loaded truck, the measuring device is zeroed, the truck is removed, and the "rebound" is measured. While there is a considerable body of literature attending this process, it is rapidly disappearing from use because of its labor cost, lack of consistency, and the need to disrupt traffic.

Dynamic devices apply a repeated or cyclical load to the pavement surface and measure response (deflection) with a series of sensors similar to those used in seismic work. Dynamic devices are either mechanical and hydraulic.

Mechanical systems function by rotating an eccentric mass about a shaft, imparting a repetitive load to the pavement surface through a wheel, shoe or plate. There has been more research and more applications completed with this type of device than with any other. It is in fairly wide use by many public agencies and private firms. A limitation is that it employs a small load, typically 2 Kips or less, and for many heavier pavement sections, the device is not capable of generating enough deflection to assure consistent results.

Another type of dynamic device applies a load hydraulically to the pavement, through a plate or shoe. Response is measured through a series of sensors, spaced at uniform distances from the point of load. The advantages of this type of device are: larger imparted loads (up to 10 Kips in some machines); ability to vary load and to "sweep" loads across a range to examine linearity of response; and ability to vary frequency of load application to eliminate

harmonic effect from the final data. Data analysis is typically either on empirical or elastic layer basis, as with the mechanical devices.

The newest, and most widely accepted, deflection device for testing of pavement on airports operates on a somewhat different principle. This is an "impulse" device which makes a single application of load by dropping a mass and transmitting the load to the pavement through a plate or shoe. Response is measured through a series of sensors. Applied load is variable, determined by the height of the drop, and reaches up to 30+ Kips in some machines, although 20-22 Kips is a more typical upper range. The larger load, at least in theory, more closely approximates heavy wheel loads, an obvious advantage.

Deflection Testing Methodology. Two primary analytical models, "elastic layer" and "finite element", are used in computer programs which predict materials strength based on deflection data. Most comparative results indicate that either methodology can produce reliable results. Other proprietary, or empirical, "inches of overlay" analyses based on deflection testing alone should be used with caution.

Users of deflection testing techniques should not be overly concerned about the complexity of analytical models, except in research applications. It is far more important to achieve a high level of accuracy in testing and analysis by use of available complementary procedures, and to have competent consultation in application of results.

Ground Penetrating Radar

One of the most critical parameters in deflection analysis is pavement layer thickness. Elastic layer analysis is very sensitive to layer thickness. Moduli may vary by several hundred percent, based on the thickness value used. In fact, under extreme circumstances, the moduli produced by such analysis can vary up to one hundred percent with a thickness variation of only one inch.

Ground Penetrating Radar (GPR) supplements deflection testing by providing accurate layer thickness information for use in the computer model. This technique should be used to complement deflection data unless pavement information is known to be consistently accurate, or where data is being used only to evaluate subgrade characteristics.

In addition to its application as a supplement to deflection testing, ground penetrating radar should be a primary tool for locating and mapping voids under pavement. When used in a ground-coupled mode at high center frequencies,

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it is acknowledged to be the most accurate nondestructive technique available for identifying and quantifying voids in and under pavement. Accurate dimensional information is available with GPR and, further, the equipment is capable of discriminating between actual voids and areas where weak or minimal base or subgrade support is present.

Finally, where load transfer is important, GPR provides a direct reading of joint deterioration characteristics such as durability failure versus keyway failure.

Thermal Infrared Thermography

Yet another nondestructive technique which has application in pavement evaluation is Thermal Infrared Thermography (TIR). The primary application in airport pavement evaluation has been detection of corrosion induced delamination in reinforced concrete pavements. Recently, however, TIR has been successfully employed in such diverse projects as mapping asphalt overlay debonding, and location of bond failures in porous friction courses.

The primary advantages of this technique are rapid data acquisition, minimum traffic interference, and a degree of accuracy not attainable by manual or mechanical acoustical techniques.

Other Testing

Depending on specific project requirements, other types of testing may be required. These may include laboratory testing of pavement core samples, subsurface exploration, field or laboratory determination of bearing capacities, and laboratory testing of pavement materials. It is important to employ such techniques in conjunction with visual inspection and nondestructive testing, and to a limited extent, for calibration of nondestructive test results. This procedure assures the User that such additional testing will be properly focused and attendant costs will be held to a minimum.

Evaluation

The dominant analytical tool in pavement evaluation and management is the microcomputer. Software is available which is capable of analyzing individual distress types identified in the PCI inspection, by directly accessing inspection data files. Based on this distress analysis, the best programs recommend a corrective action, and offer viable alternative actions, for each individually analyzed pavement section. Identified alternatives are accompanied by estimated costs and resultant pavement life expectancy.

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This multiple option analysis is at the heart of the most modern pavement management computer programs available today. These programs permit analysis for any year, allowing for impact of delayed actions, and providing an excellent basis for meaningful multi-year programming.

At commercial service airports, capacity analysis should be a part of the comprehensive program. Capacity analysis is a predesign function which allows the User to rapidly view the structural capacity of pavement under existing or forecast traffic. For such pavements, a computer program which provides rapid assessment of capacity is essential. In pavement management, capacity analysis from an "engineering" perspective, rather than from an "operations" perspective is preferred. A brief description of key elements of one such program is presented below.

Basically, the program designs a theoretical structural overlay for each section of pavement using existing in-place materials as the foundation, and actual, or forecast, traffic loads. The result may be a "plus", "minus", or "zero" value. A zero indicates existing pavement is exactly balanced to aircraft loads. A plus overlay indicates pavement which is not structurally adequate, and a minus overlay indicates pavement which has capacity in excess of that required for aircraft loads.

This approach to capacity analysis allows an engineer to visualize the degree of "imbalance" in a pavement system, and to plan and design projects to restore that balance.

Ultimately, the program makes possible a most economical design for rehabilitation of airfield pavement. Each pavement section is analyzed separately, taking maximum advantage of known conditions. Pavement sections are compared for load vs. capacity imbalance. Rehabilitation strategies can then be developed to provide just the right capacity for each pavement section while making best use of existing material strength. This approach is equally beneficial for all pavement types.

Capital Expenditure Planning

A major factor in a pavement management program is an ability to assemble all data into a realistic, meaningful and supportable Capital Improvements Program. These programs must be capable of assembling results from analytical modules into a Capital Improvement Program, and must allow the User to shift projects from year to year, or to change projects in a given year, to match budget restrictions and priorities. With each such shift, new cost estimates must be calculated in future year dollars, and service life forecasts must be revised.

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Maintenance Programming

Users can do extensive maintenance planning from the basic management program and survey data. In addition to these aids, a comprehensive maintenance program should be available to quantify maintenance correctable distress types, estimate materials and costs for maintenance activities, and outline procedures which are particularly suited for the specific User's pavement system.

CONSEQUENCES AND BENEFITS

This new technology isn't free. Pavement Management costs money, and it can be hard to sell to money managers, but the return on investment will be well worth the effort. Pavement Management is the only acceptable way to know how to do the right thing at the right time on a pavement system.

Let's face facts. Nobody is going to go out and save money with this technology. You will continue to take all the money you can get, and you will continue to spend all of that money. That is just the way things work.

The point is, by managing your pavement system, you will be able to do much more with the money you have. And most of the time, you will have more money available because you will be able to document and justify your needs. The result will be a more serviceable pavement system, reduced liability and, probably, accelerated expansion made possible by improved credibility, good will and increased use.

THE MOST IMPORTANT INGREDIENT

Before I sit down, let me take a minute to point out what pavement evaluation and management are all about. It's not computers or deflection and friction testers or ground penetrating radar or infrared thermography or lazers. It's people, just has it has always been. People design pavements and people construct them and people maintain them, and it is people who must evaluate and manage them.

Computers and hi-tech test equipment are only tools, and they can only be as useful as we make them. We sometimes tend to be mesmerized by our bells and whistles, and we forget the sweating, sunburned, dedicated, hard working people who go out there every day and make the system work.

They run the mixing plants and the pavers and the shovels. They seal the cracks and patch the holes. And they collect the pavement information that we plug into our

computers to manage our systems. Our pavement inspectors are the last people who actually see the pavement. All subsequent evaluation and management procedures and decisions are based on their input. What we do can only be as good as what they do.

Computers have a marvelous capacity to ingest and sort and process and present information. Computers don't even care if that information makes sense. We must care. We must strive for better standards, training and quality control at that critical point where eyeballs and hammer and radar signal and camera and lazer meet pavement. That's where it matters most. And I fear that we have computer programs today capable of analytical precision exceeding the quality of our data collection procedures.

We will solve this delimma, as we must, but we must always be mindful of the "guy on the ground" - our point man. He is the key to any successful Pavement Management Program.

SUMMARY

Pavement Management, as we know it today, is certainly the fastest growing technology in Civil Engineering. New developments are being marketed virtually every day, and existing techniques and products are being used in new and exciting ways. Almost nothing is fixed in time. Projects you hear about today were done with "state-of-the-art" technology which may have already been superceded by new and better methods.

The seeds for progress have been sown. The bosses have taken up the cry. Pavement Management is the "in" thing. Don't look for pat solutions, though. Don't be expecting black and white answers. There hasn't yet been time to figure them all out. The industry is working on better and better solutions. Pavement Management is a valuable tool for managers of airport systems that is here to stay, and is destined to take an important place in our society.

PROGRAM OUTLINE

EFFECTIVE PAVEMENT MANAGEMENT

Tuesday, April 23

12:00 Registration

12:30 Introductions & Course Overview

Introductions and welcome. Discussion of the purpose and content of the program.

1:00 History and Importance of Pavement Management

Review of traditional methods used by engineers to assess pavement conditions. Examples of shortcomings of such methods. Emphasis on importance of documenting and justifying budget requests.

1:30 PCI and Other Pavement Evaluation Systems

Summary of traditional destructive and non-destructive testing techniques. Introduction to PCI method of pavement inspection and PCI terminology used in Pavement Management Systems. Importance of consistency in data collection. Value of computers in data processing.

2:30 Break - Questions & Answers

3:00 Use of Computers in Pavement Management

Explain the evolution of pavement management software. Discuss what information pavement management software should provide the user in order to facilitate decision making.

3:30 AIRPAV -- Eckrose/Green Advanced Pavement Management Software.

Present AIRPAV programs to explore how pavement condition information can be utilized to generate effective decision making information.

4:30 Adjourn

5:00 Eckrose/Green-Donohue will provide transportation to Brewers-Rangers game.

PROGRAM OUTLINE

PCI INSPECTOR TRAINING COURSE

Wednesday, April 24

7:30 Coffee & Doughnuts

8:00 Introduction & Course Overview

8:15 PCI Method of Pavement Evaluation

Describe the PCI method of pavement evaluation. Show how a PCI is calculated for both flexible and rigid pavement. Mention that a PCI survey provides more than just a numerical rating, and relate this concept to the importance of accurate distress identification and measurement.

8:45 Pavement Network Layout

Step by step presentation of the importance of accurate sketches and construction history. Show how sketches are developed, beginning with an outline, and adding sample units and features. Mention that identification of features continues throughout the project. Present standard Feature and Sample Unit identification procedures. Show alternative numbering techniques. Emphasize the inspectors role in verifying and making modifications on site.

9:30 Break - Questions & Answers

10:00 Pavement Dynamics and Introduction to Distress Types

Present pavement dynamics, in general, as summarized in Chapter 4 of our manual, "Airport Pavement Inspection by PCI". Then introduce distress types for flexible and rigid pavement, and present the pavement dynamics contributing to each distress.

10:30 Tools of the Trade

Present equipment necessary to perform a pavement condition survey by PCI, and discuss the importance of each item presented.

10:45 Identifying and Measuring Distresses

Slide presentation of various distresses, followed by discussion of type, severity, and measurement.

12:00 Lunch

1:00 Identifying and Measuring Distresses (con't)

2:30 Break Questions & Answers

3:00 Safety on Airports

Discussion of operations on the air side. Review of radio procedures. Presentation of differences between controlled and uncontrolled airports. Importance of traffic patterns, approaches, pilots' expectations, noise and distractions, preoccupation, etc. Special considerations on busy uncontrolled airports.

3:15 Preparations for Inspection

Notification of airport Owners, collecting and checking out equipment and supplies. Maintenance of equipment in the field. Dealing with expenses, arranging extended travel schedules and equipment security. Maintaining required sketches, forms, road maps, names and telephone numbers needed for the survey.

3:30 Inspector Responsibilities On-site

Summary of team duties, including notice to Owner, sample unit layout, and inspections. Emphasis in inspector responsibilities to analyze layout for inaccuracies or possible improvements. Discussion of production versus quality, emphasizing that inspectors can achieve both by carefully evaluating each feature for probable distress types, and by knowing severity criteria cold.

3:45 Exam

Fifty slides of pavement distress will be shown. Each will be illuminated for one minute. Participants will identify each distress and severity.

4:45 Critique

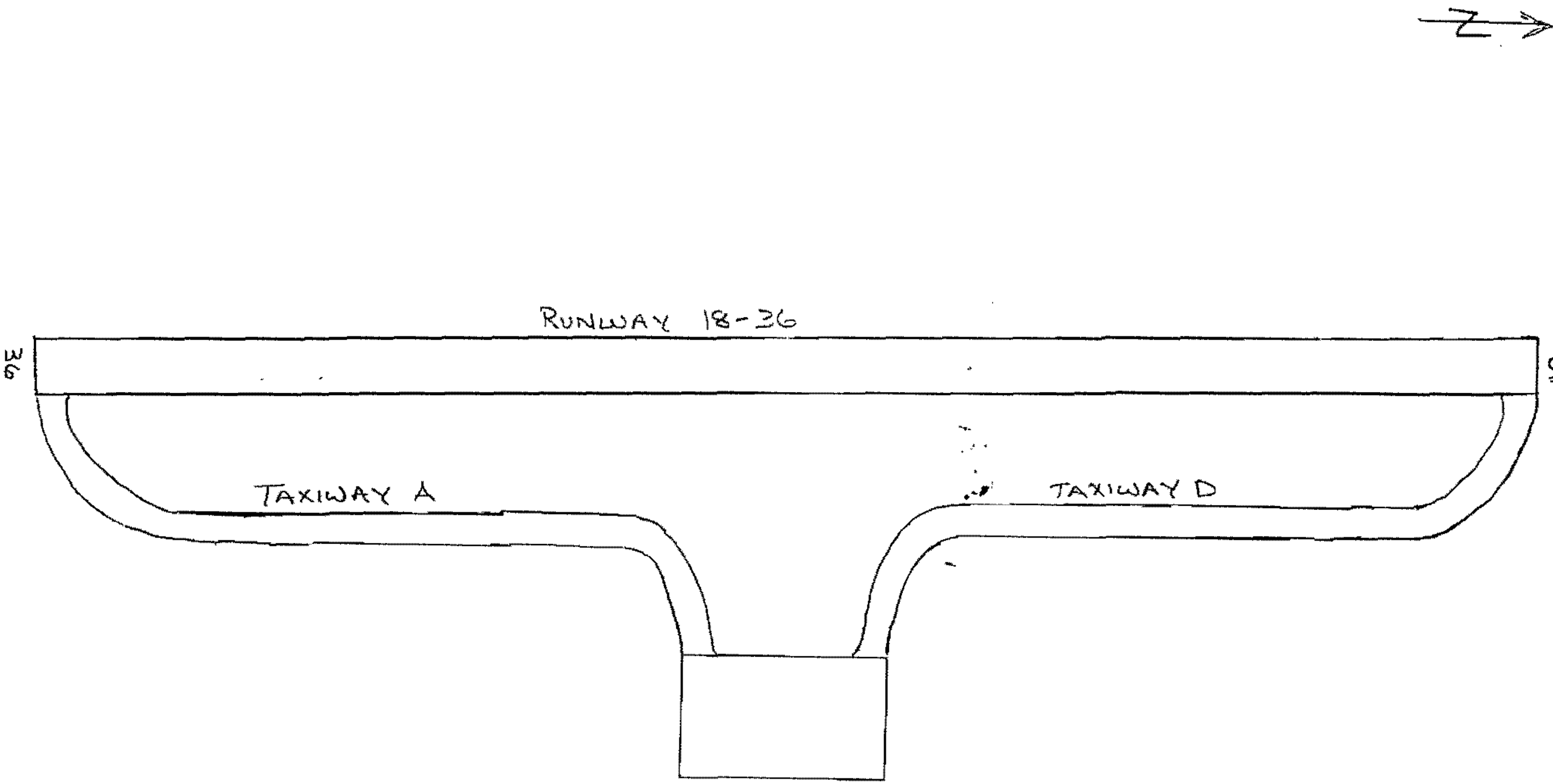
5:00 Adjourn to Hospitality Room

PROGRAM OUTLINE

PCI FIELD PRACTICE & DATA REDUCTION

Thursday, April 25

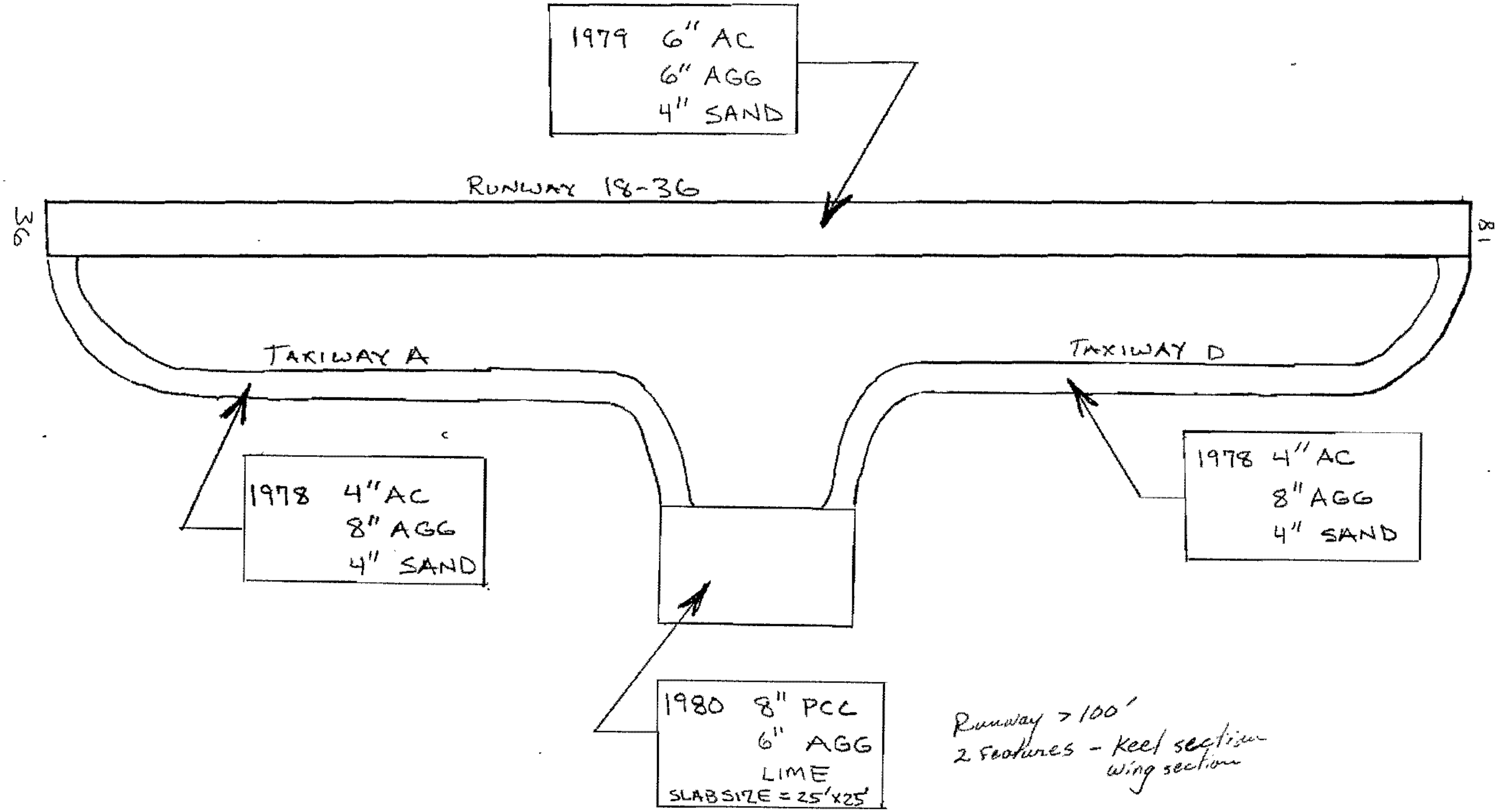
8:00	Depart for Mitchell Field
8:30	Security & Safety Briefing
9:00	PCI Pavement Inspections
11:30	Depart Airport
12:00	Lunch
1:00	PCI Calculations
2:00	Break
2:30	Using PCI Information for Pavement Management
3:30	Adjourn


N
RUNWAY 18-36
36
18
TAXIWAY A
TAXIWAY D

RECORDS RESEARCH

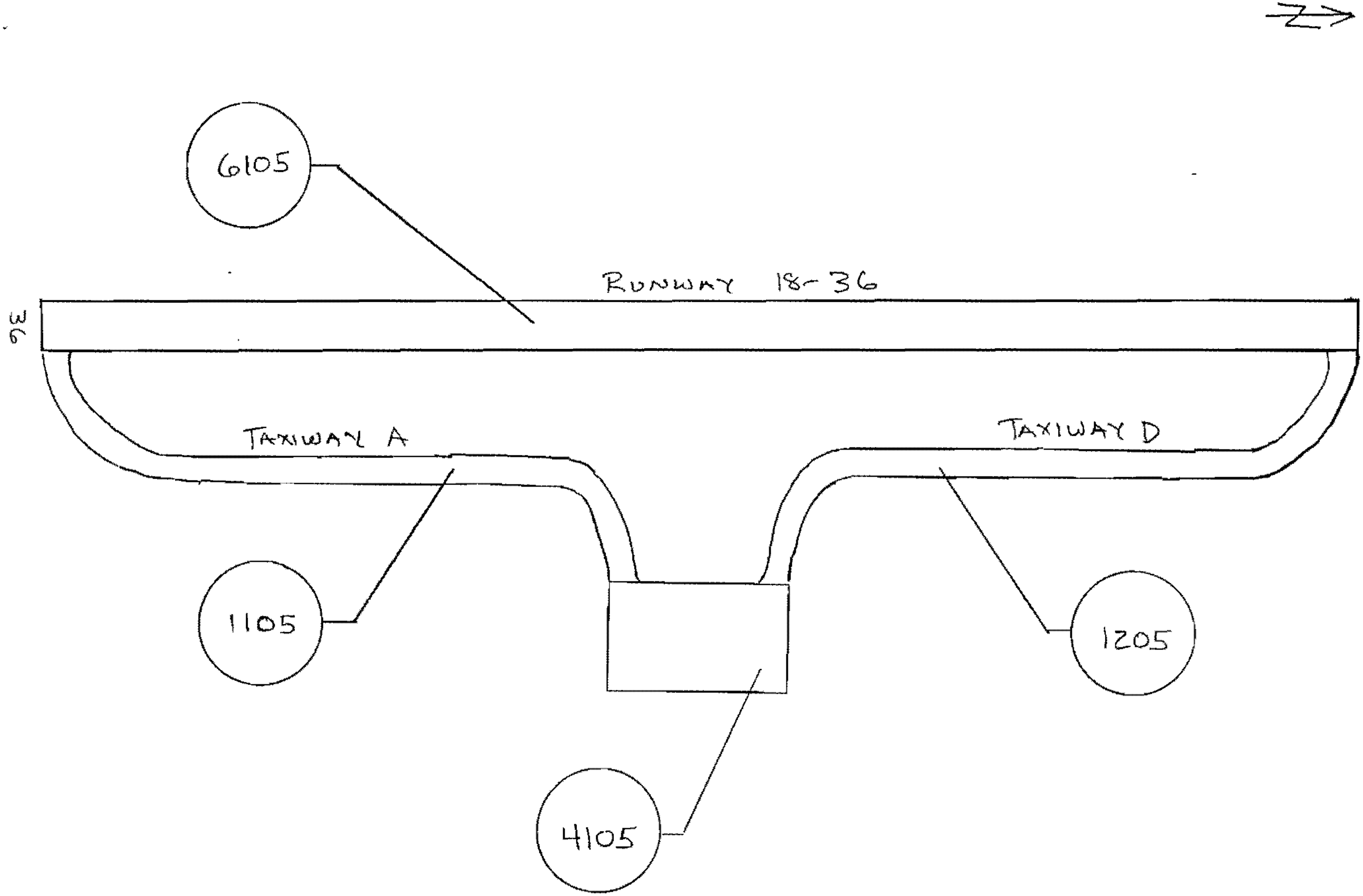
ESSENTIAL INFORMATION:

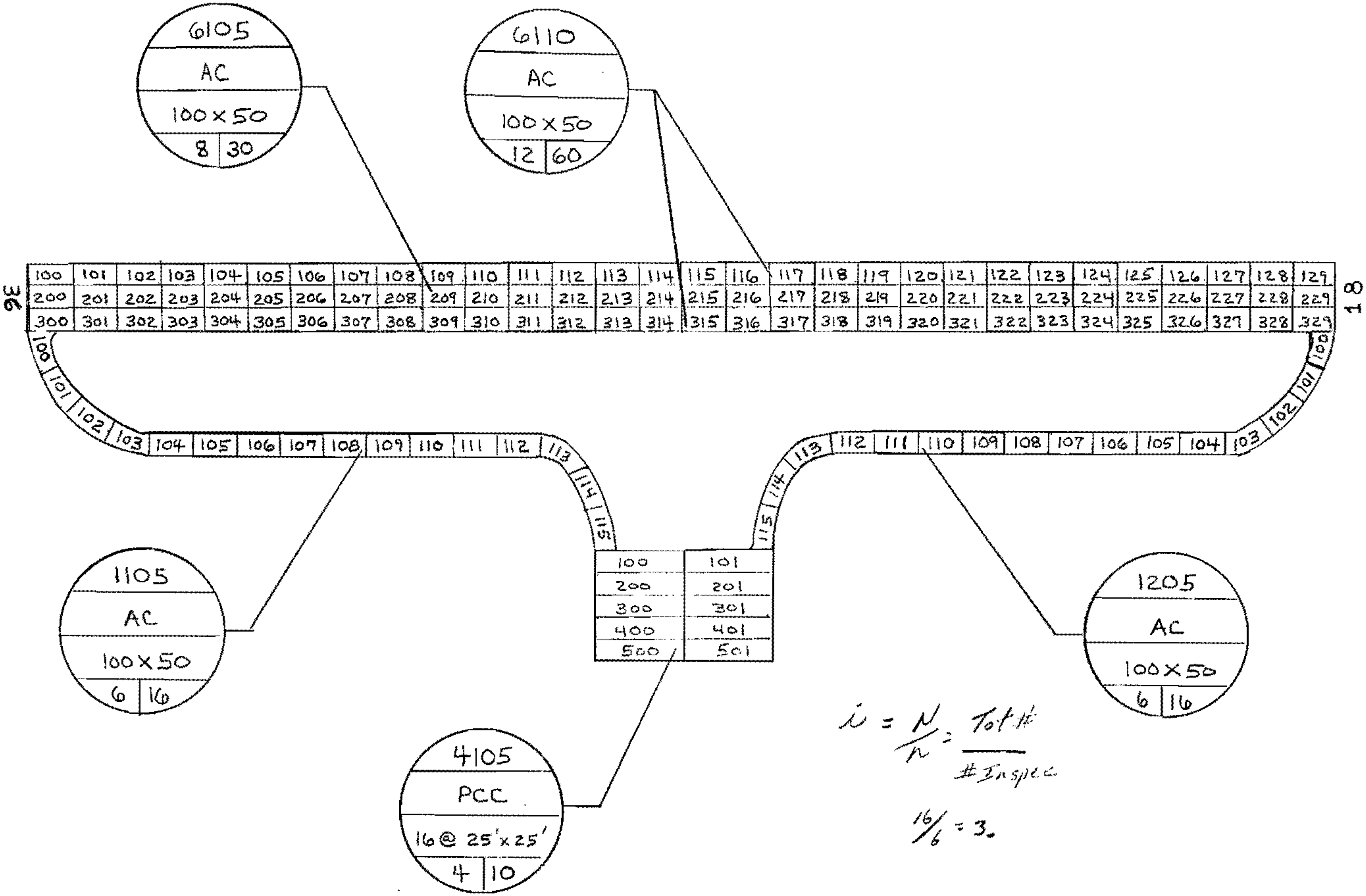
1. PAVEMENT TYPE, PAVEMENT DIMENSIONS, AND LAST CONSTRUCTION DATE.
2. FOR RIGID PAVEMENT, SLAB SIZE AND LAYOUT PATTERN ARE ALSO NEEDED.



PCI TERMINOLOGY

- FACILITY: READILY IDENTIFIABLE PAVEMENT SEGMENT SUCH AS A RUNWAY, TAXIWAY, OR APRON
- FEATURE: PAVEMENT SECTION WITH UNIFORM STRUCTURE, AGE, TRAFFIC, AND CONDITION.
- SAMPLE UNIT: DIVIDES PAVEMENT INTO ≈ SIZED SEGMENTS FOR THE PURPOSE OF INSPECTION.

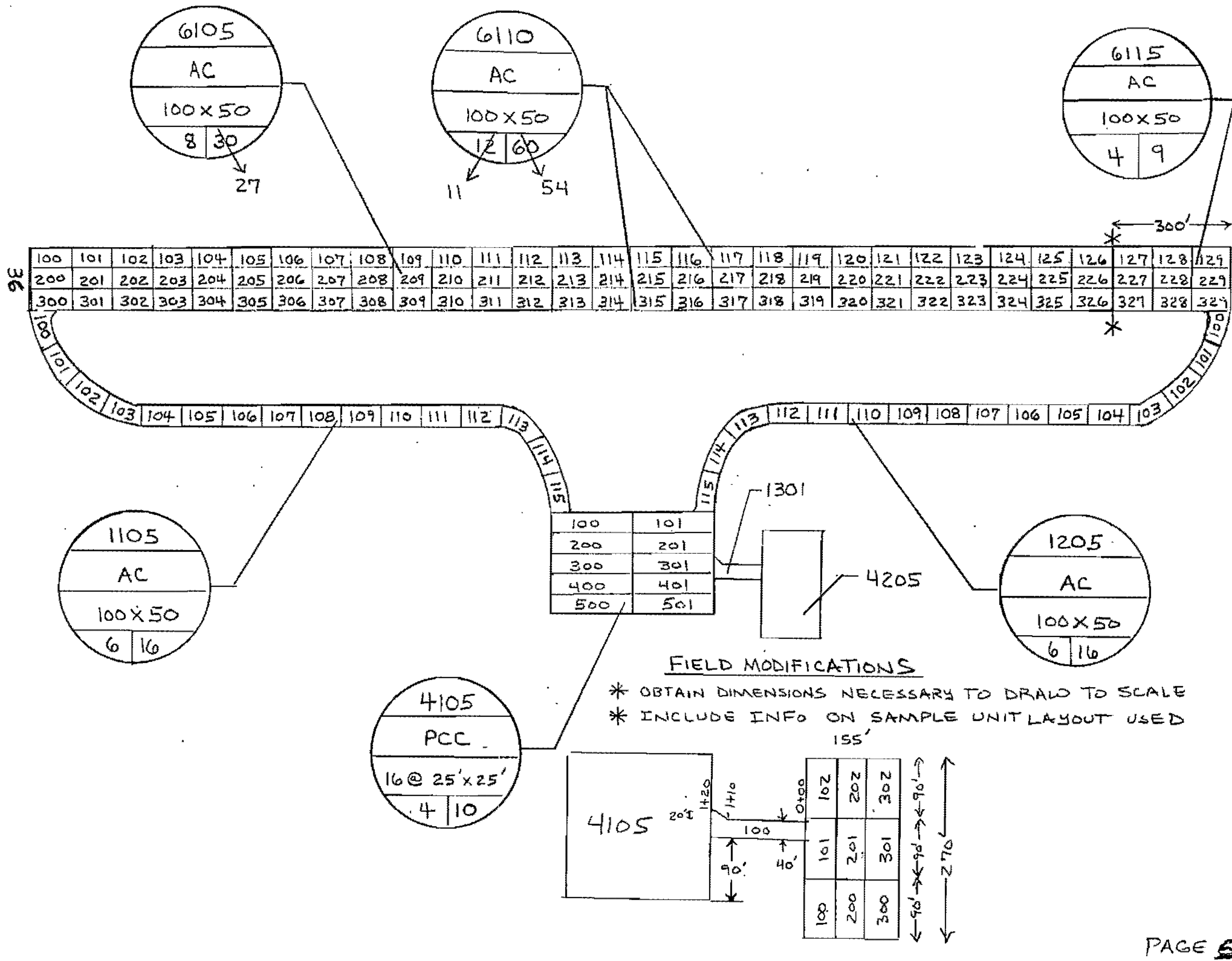

N
RUNWAY 18-36
36
18
TAXIWAY A
TAXIWAY D
6105
1105
4105
1205



$i = \frac{N}{n} = \frac{\text{Tot \#}}{\text{\# Inspec}}$

$16/6 = 3.$

INSPECTOR GOES TO FIELD — MAKES CHANGES



FIELD MODIFICATIONS

* OBTAIN DIMENSIONS NECESSARY TO DRAW TO SCALE
* INCLUDE INFO ON SAMPLE UNIT LAYOUT USED

89%

NAME: John Baumgartner

SLIDE #	DISTRESS TYPE	SEVERITY	POINTS	
1	8	M ✓	Low	1
2	1	M ✓	Low	1
3	~~8~~ ✓	M ✓		0
4	Rutting Present 1	M ✓	Not Operational Area	2
5 (ok)	8	L		2
6	2	N/A		2
7	1	H		2
8	None		Blemish	2
9	3	~~M~~ Low		1
10	8	L		2
11	5	~~M~~ L	Apron not	2
12	1	M		2
13	7	Less Than 1/8".	Not Penalized	1
14	8 + ~~5~~ 5	Not Rated ~~M~~ L	High	1
15	10	L		2
16	1	H		2
17	8	H	Wider than 3"	2
18	Plane Crash			2
19	8	M		2
20	13	L 1/4 - 1/2", M 1/2 - 1"		2
21	Structure - Not Penalized			2
22	1	L		2
23	12	~~M~~ Replace slab	39	2
24	3	~~L~~ M		2
25	~~10~~ Non-Reduction			2

43

42-381 50 SHEETS 5 SQUARE
42-382 100 SHEETS 5 SQUARE
42-389 200 SHEETS 5 SQUARE
NATIONAL

NAME:

SLIDE #	DISTRESS TYPE	SEVERITY	POINTS	
26	13	L		2
27	2	L		4
28	3 ?	Less Than Low – Not	Discounted	5
29	4	L		7
30	No Damage			9
31	7	L		11
32	8	N/A		13
33	3	L		14
34 ?	4	M		16
35	9	N/A		18
36	5	H M ?	H ?	20
37	World's Best PCI	HAT		22
38	10	L		24
39	3	Less Than Low	Low	25
40	12	H		27
41	4	H		29
42	11	M		31
43	3	L → M		32
44	14	L		34
45	5	H		36
46	14	Less than Low		38
47	3	M		40
48	10	M		42
49	15	L		44
50	13	N/A		46